VETERINARY MEDICINE

FEBRUARY 1942

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D. M. CAMPBELL, *Editor*
7632 S. Crandon Ave., Chicago, Ill.
Telephone South Shore 7160

H. J. MOSTYN, *Eastern Representative*
1265 Broadway, New York, N. Y.
Telephone Murray Hill 4-4037

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The army ration provides for at least one egg a day for each soldier, which means that more than a million eggs per day are being used at our army camps.

* * * * *

It is only in comparatively recent wars that more men have been lost from military action than from disease. The ratio of the disease death rate to the battle death rate among U. S. troops was 7 to 1 in the Mexican war and 5 to 1 in the Spanish war.—*U. S. Pub. Health Repts.*

* * * * *

While our domestic needs for more of some foods have become apparent, the picture of British needs has become more clear. We are planing to send the British during 1942, under the Lease-Lend program, dairy products that will require between 4,500,000,000 and 5,000,000,000 pounds of milk; about 500,000,000 dozen eggs; 18,000,000 pounds of poultry meat—chicken for the most part; almost 1,500,000,000 pounds of pork and lard. We have promised to send almost 1,250,000 tons of fruit and more than 2,500,000 cases of canned vegetables. There are other commodities included in our food commitments, but those cover the principal items.

During World War I, mice got into wheat stores in Australia. They were so prolific that when an attempt was made to exterminate them, in one wheat yard 70,000 mice were killed in one afternoon.

* * * * *

The Committee on Veterinary Medicine of the Procurement and Assignment Service for Physicians, Dentists and Veterinarians, established by order of the President, is composed of the following members: J. G. Hardenbergh, Chicago; Harry W. Jakeman, Boston; John R. Mohler, Washington, D. C.; William A. Hagan, Ithaca, N. Y.; Cassius Way, New York.

* * * * *

That American soldiers, with their high meat ration, are physically better equipped to withstand certain types of war gas than are vegetarians, is reported by scientists of Fordham University. Cystine and methionine are found in meat and certain other protein foods. These compounds when fed to rats detoxicate benzene derivatives (which were used extensively in World War I). These constituents of meat also prevent ill effects from pyridine and naphthalene.

Livestock and meat production in the United States showed a sharp increase in 1941 over the 1936-40 average; and production goals for 1942 call for an even larger increase. Greater production is made necessary not only by our own defense needs, but by British requirements. It is estimated that the British will need from this country about one-quarter of their supply of animal protein foods—enough to feed approximately 10 million people.

Animal Health

Evidence of the increasing interest among live stock producers in maintaining the health of their animals is found among the pure bred live stock men who have refused to exhibit their animals at county fairs because fair officials fail to give protection against bovine brucellosis, hog cholera and other contagious maladies.

Too often, trucks fresh from the stock yards have been used in transporting pure bred livestock on the return trip without being thoroughly disinfected. County fairs, like local auctions, will sooner or later have to come under sanitary regulations that will prevent the spread of disease and maintain the health of herds and flocks in local communities and throughout the states.—*National Live Stock Producer.*

Florida Will Raise Cattle

Florida will have an opportunity to raise cattle instead of ticks if the bill favorably reported by the Senate Committee on Indian Affairs becomes a law.

Cattle fever tick eradication in Florida has been stymied for several years by Rip Snortin' Ickes, Secretary of the Interior, who forbade killing of the tick-infested deer on Indian lands, not that he loved the ticks more or the Indians less, but just out of inborn perversity.

The proposed bill, if passed, will prevent any further interference by Ickes with the tick eradication project of the Department of Agriculture. Within 35 years this project has banished ticks from 13 of the 15 states originally infested. Ickes shares, with the late Huey Long, the distinction of having blocked progress for a long period in the cattle industry of the south.

Federal legislation (S 1261) to punish interstate traffic in stolen cattle has been passed and signed by the President. When first proposed the bill included hogs, sheep and horses, but they were later dropped from consideration.

The Bureau of Animal Industry, U. S. Department of Agriculture, reports that the spread of swine erysipelas has threatened to impede defense efforts to increase pork production in the Corn Belt. Dr. A. W. Miller, assistant chief of the Bureau, appeared before the House appropriations committee to ask for an appropriation to extend the federal-state culture-serum vaccination against swine erysipelas to Iowa, Illinois and Indiana, in addition to South Dakota, the original home of the disease, and Nebraska, its chief citadel. Already a half-million hogs have been vaccinated in the latter state.

At the request of the Chinese government, this country is sending a commission of medical and sanitary officers and entomologists to control malaria and supervise sanitation and medical care of 250,000 Chinese laborers employed in the construction of a railroad in one of the most highly malarious sections of China. The U. S. Public Health Service and the International Health Division of the Rockefeller Foundation are both contributing members to the personnel of the commission, for the salaries of which, as well as for the drugs, chemicals and medical supplies, the United States Government is supplying approximately $1,140,000 under terms of the Lend-Lease Act.

The commission has on hand 10 million tablets of quinine, two million tablets of atabrine and an ample supply of Paris green, kerosene, spray pumps, and other anti-mosquito supplies.

Mosquito control work along the "Burma Road" will require at least 50 tons of Paris green, 200 gallons of pyricide 20, and 4,000 gallons of kerosene.

In experiments reported by Dr. John A. Cameron of the University of Missouri, x-ray treatment was effective in saving the lives of rats and monkeys nearly dead from carbon monoxide poisoning. Untreated controls either died or recovered much more slowly.

* * * *

The study of filterable viruses and of disease caused by them is handicapped by the relative lack of *in vitro* reactions which can detect very small amounts of virus substance. To overcome this difficulty, Rockefeller Foundation workers have developed a method of collodion fixation by immunological complexes of sufficient delicacy—about 1000 times that of any heretofore described reaction—to permit the *in vitro* identification of certain viruses.

* * * *

Encephalomyelitis Virus Isolated from Naturally Infected Mosquitoes

Specialists of the Bureau of Entomology and Plant Quarantine assisted University of California and Washington state and local health authorities in collecting nearly 10,000 mosquitoes, flies and other biting insects this season, and tested them for viruses of encephalomyelitis. The work was conducted in the Yakima Valley of Washington because 27 humans and 40 to 50 unvaccinated horses had been ill with the disease in that area during the summer of 1940.

The insects were identified, frozen and shipped in dry ice to the San Francisco laboratory of the University of California. Then they were divided into lots or "pools" according to family and species, washed, ground and the "liquid" injected into mice. One pool composed of *Culex tarsalis* mosquitoes produced symptoms of St. Louis encephalitis. Another pool of the same kind of mosquitoes produced western equine encephalomyelitis.

While it has been demonstrated previously (by Kelser) that mosquitoes can transmit the disease under laboratory conditions, this is the first time that mosquitoes collected in the field have been proved to be carrying the disease virus. *C. tarsalis* is widespread in states west of the Mississippi.

3,110 Horses, 140 Mules Join Army

Under the War Department procurement program 3,110 horses and 140 mules were acquired during the last three months of 1941. The cost was about $533,850.00.

Horses and mules for military use are now being purchased in the following United States remount areas:

Southwestern Remount Area, Colorado Springs, Colorado.

Northwestern Remount Area, Salt Lake City, Utah.

North Central Remount Area, Kansas City, Missouri .

East Central Remount Area, Lexington, Kentucky.

Western Remount Area, San Mateo, California.

South Central Remount Area, San Angelo, Texas.

Eastern Remount Area, Front Royal, Virginia.

All animals purchased by the Army Remount Service must be gentle, well-broken and in good physical condition. It is also imperative that the animal be a good mover at the walk, trot and gallop.

Today animal units to hold their place in the modern Army must be able to operate at a faster rate of speed and more efficiently than ever before.

Animals purchased by the Remount Service are conditioned and trained for future use in the Cavalry and Field Artillery units. Each horse and mule is examined by an Army Veterinary Corps Officer before being purchased.

During the last fiscal year this Remount Service has spent $3,466,688 on more than 175,000 tons of forage. This included 94,058 tons of hay, 59,470 tons of grain, 21,506 tons of bedding, 549 tons of salt and 21 tons of soda ash.

The 37,021 horses and mules supplement their prepared diets with pasture grass. The annual ration cost last year averaged $103.94 for light horses, $120.15 for heavy horses and $93.40 for mules.

The best fed Army in the world applies not only to the American soldier, but also to army animals.—*The National Horseman.*

Vaccinate Heifers in Community Pastures

In a press release published widely over the state, Dr. V. S. Larson, livestock sanitation chief of the Wisconsin Department of Agriculture, gives some cogent reasons for vaccinating heifers against brucellosis if they are to be pastured away from home. Says Doctor Larson: "Recently the department found several herds of cattle infected with brucellosis in one community which it had expected to find entirely disease-free. On investigation it was learned that the owners of these herds had sent their young stock to a community pasture last season, all properly tested and healthy. However, one animal from a badly infected herd had gained admission to the pasture in violation of state regulations, and had spread brucellosis infection which was carried back by the young stock to the home herds in the fall."

* * * *

Dollars from Brucellosis Immune Cows

During a period of years prior to 1936, H. A. Holdridge of Ohio had lost some 40 Guernsey cows from brucellosis — that is, they had reacted positively to the test for brucellosis and had been disposed of.

Starting in 1936, Mr. Holdridge decided to operate two farms—one for the cows negative to the test and one for the reactors. He arranged not only to keep his own reactors, but also to buy well-known brood cows of the same breed that were headed for the slaughter pens because of a positive reaction. And have they been worth keeping! Their names rank high in Guernsey circles. Some of these cows and their records are:

Langwater Ann, with a record of 783 lbs. fat in B. She has a maternal sister, Langwater Angela, with 940 lbs. fat in A, which makes her the highest daughter of Langwater Steadfast. Ann has dropped three bulls and one heifer, and is in calf at present. Last spring Holdridge sold her heifer in the May Royal Steadfast sale for $750.

Omega Tully, with a record of 615 lbs. fat in AHI, is the dam of Franchester Clara, with 930 lbs. fat in B and 923 lbs. fat in DD. This cow is also the dam of such outstanding individuals as Franchester Claudis, Franchester Cane, and Franchester Cameo. Since Holdridge has owned her she has dropped Holdridge Cane, Holdridge Constant, and Holdridge Clara. Omega Tully has never lost a calf in all these years. Her bull calf was sold to Costa Rica for $475.

Villa Way Marigold has a record of 703 lbs. fat in A. Her daughter brought $375 this spring. Lincoln Way Ultra Hope, with 624 lbs. fat in G, reacted once and has been clean ever since. Romona's Chalys of Elgercon has 667 lbs. fat in B. She is 16 years old and is in calf, her fourth since her positive reaction.

Other outstanding cows include Langwater Mary Anne, with 674 lbs. fat in B; Langwater Annette; Green Meadow Moneta, 783 lbs. fat in B; Warel Dot, 627 lbs. fat in BB; Edinham Gallant Queen, 604 lbs. fat in A; Edinham Queen Anne, 591 lbs. fat in C; Edinham Gallant Norman, 568 lbs. fat in CC; Polly Candata of Playwicky, 552 lbs. fat in D; three daughters of Langwater Devoe, who has 10 A. R. daughters; four daughters of Langwater Pal; one double granddaughter of Florham Barrister, a son of Langwater Country Gentleman.

As a strictly business proposition, these cows are profitable. Their average cost is between $60 and $100. They soon pay for themselves in milk, and the returns from the sale of purebred progeny is all profit.

Reactors that breed regularly are usually immune animals and therefore the most valuable—the most profitable animals in the herd.

The demand for the progeny of these great cows is shown by this excerpt from the *Guernsey Breeders' Journal* story of the May Royal Steadfast sale:

"A highlight in the sale was the splendid way breeders received the three heifers consigned by Harold Holdridge, Holdrige Farm, Ohio. The Holdridge consignment, consisting of three daughters of Langwater Columbus 236365, showing extreme uniformity and dairy character, sold for $1,625, or an average of $541.67 per head."

During the past five years, only one cow of this entire "positive" herd has aborted. Never have any of the progeny reacted to the brucellosis test.

Today many Guernsey breeders look toward the Holdridge Farm as a sanctuary for any of their great brood matrons that may react to this test. All of them want to have the blood of these good cows passed on —not lost at the packing plant.—*Hoard's Dairyman.*

Defense Against Foot-and-Mouth Disease

The present war has augmented the constant threat of foot-and-mouth disease to our livestock industry. As a protective measure against this new threat Chief Mohler

Tongue lesions of foot-and-mouth disease

has written all state veterinarians and inspectors-in-charge in the Atlantic, Gulf and Pacific coast states in part as follows:

Incidental to the war emergency British warships have arrived at various ports in this country for overhaul. It is quite certain that any fresh meats on such vessels will have originated in countries where foot-and-mouth disease exists; hence the proper disposal of garbage therefrom is especially important. Some of these ships have put in at rather obscure ports and docks, where facilities for such disposal are entirely lacking, and instances have been disclosed where some of the garbage actually was transferred to farms in the vicinity of the port.

It is desired that you make careful inquiry in an effort to determine all places in your district where warships that are likely to have fresh meats of foreign origin have put in for repairs or other purposes. You should communicate with the nearest Bureau stations on the coast in order that no place where such vessels have put in may be overlooked. You should then ascertain what facilities, such as incinerators, rendering plants or similar establishments, may be available in the vicinity of each of those places for the safe disposal of garbage. At the same time the matter should be taken up with naval officers in charge of the district, as well as state authorities, and their cooperation enlisted in preventing any unauthorized removal of garbage.

. . . . . .

Please report to the Bureau the results of your investigations and conferences with naval officers and state officials, including the names of ports where war vessels have arrived from foreign countries and facilities available for disposing of garbage.

Regulations have long provided for the safe disposal of garbage from merchant and other ships putting in at regular ports, and it will be remembered that two outbreaks of foot-and-mouth disease nearly 20 years ago were caused by violations of these regulations.

Veterinary Survey in Argentina and Chile

By arrangement with the governments of Argentina and Chile, Dr. S. O. Fladness,

Foot lesions of foot-and-mouth disease

Chief of the Field Inspection Division, Bureau of Animal Industry, U. S. Department of Agriculture, is visiting those countries to obtain first-hand information on the livestock and animal-disease situation there. The survey will continue for approximately two months.

Doctor Fladness' observations will include conditions particularly in the southern part of South America, including the Island of Tierra del Fuego, which comprises parts of both Argentina and Chile. Because of previous residence in Argentina and broad knowledge of the South American livestock and veterinary situation, Dr. Fladness was selected as being especially well qualified for the assignment. He speaks Spanish and is a veterinarian having long experience in the administration of animal quarantines. The survey of the livestock situation in the two countries will deal largely with the question of the existence of foot-and-mouth disease in the regions mentioned.

Vitamin B_1 (Thiamin Hydrochloride) in Veterinary Practice

The identification, isolation and eventually the synthesis of numerous vitamins have revolutionized diet therapy in many diseases. Vitamin B_1 has been called the most important one of all in small animal practice and it is possible that thiamin deficiency is a factor in many more disease conditions than we now believe.

The use of large quantities of thiamin for replacing the vitamin removed from flour in the whitening processes has resulted in the manufacture of the synthetic form on a large scale; as a result the price has decreased from several dollars to less than one dollar per gram wholesale. The low price and ready availability should make thiamin a standard in every veterinarian's office.

Excellent results have been noted in practice from the use of B_1 in convalescence following distemper, chorea, diarrhea and accidents, and in cases of chronic constipation, inappetence, certain forms of hysteria and other nervous disorders.

Vitamin B_1 is comparatively non-toxic. The lethal dose on intravenous injection in a dog was found to be 350 mgm per kilogram body weight, and the lethal oral dose was forty times as great. The normal requirements of a dog are a little more than 100 micrograms per pound of food; thus a dog requiring 2½ lbs. of food per day requires a little more than 0.25 milligram of B_1. For use in therapeutics, we can increase this considerably and it is suggested that a solution should be prepared as follows:

Thiamin hydrochloride	300 milligrams
Water	1 ounce

As an initial dose per os as much as 1 dram is advisable for an average dog; this can be followed by 1 or 2 drops on the food daily

In cases where efficient absorption from the intestinal tract is unlikely due to gastroenteritis, etc., the injectable form is, of course, indicated. For general use as a tonic, in place of, or as an adjunct to, many of the older "tonic" preparations, the solution is cheap, easy to prepare and dispense, and harmless. General use will almost certainly produce some highly satisfactory results and occasionally a spectacular recovery from an apparently hopeless nervous disorder.—*Canadian Journal of Comparative Medicine and Veterinary Science.*

* * * *

Tests at the Ohio Agricultural Experiment Station have shown that soy bean oil meal is decidedly preferable to whole soy beans as a source of protein for fattening steer calves.

* * * *

The Reservoir of Encephalitis Virus

Until two years ago no invertebrate had been found naturally infected with the virus of equine encephalomyelitis. In the summer of 1940 assassin bugs were found naturally infected in Kansas.[1] More recently research workers have isolated this virus from naturally infected mosquitoes.[2]

There has been much speculation as to where the virus of equine encephalomyelitis, which is also the virus of the commonest form of human encephalitis, spends the winter. The observations of Wheeler and Roderick[3] afford a possible explanation of the survival of the virus during the seven or eight months of each year during which no cases of the disease occur in horses nor in man.

The suggested explanation is: The virus is transmitted through the egg of the assassin bug to the next generation. The eggs are deposited in the nests or dens of rodents, upon which the newly-hatched assassin bugs feed, infecting them. When mosquitoes arrive with the advancing summer they in turn transmit the virus to man, horses and birds. When mosquitoes disappear or rodents go into hibernation with the approach of fall, the disease disappears, only to be carried through the winter in the oncoming generation of assassin bugs. Further investigation will be required.

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[1] Kitselman, C. H., and A. W. Grundmann, 1940. Equine encephalomyelitis virus isolated from naturally infected *Triatoma sanguisuga* LeConte. *Kans. Agr. Exp. Sta. Bull.* No. 50.

[2] Hammon, W. McD., W. C. Reeves, B. Brookman, E. M. Izumi, and C. M. Gjulin, 1941. Isolation of the viruses of western equine and St. Louis encephalitis from *Culex tarsalis* mosquitoes. *Science* 94, pp. 328-330.

[3] Wheeler, J. A., and Lee Roderick, 1941. Western equine encephalitis occurring among human beings in Kansas during the summer of 1941. *J.A.M.A.* 117:23, pp. 1972-1973.

Death Takes Prominent Veterinarian

Albert T. Kinsley was born at Independence, Ia., February 26, 1877, and died at his home, 616 E. 59th St., Kansas City, Mo., December 8, 1941.

Doctor Kinsley was graduated from the Kansas State College with the degree of B.S. in 1899 and was employed as assistant in the veterinary department there. In 1901 he received the degree of M.S. from the same institution, having majored in bacteriology. In 1904 he was graduated from the Kansas City Veterinary College and immediately began teaching in that institution, first as assistant in histology and pathology and later as head of both departments. After R. C. Moore retired in 1913, he became president of the institution and held this office until the school suspended operations in 1918, after which he operated the Kinsley Biological Laboratories in Kansas City until 1940, when on account of failing health he sold it to the Corn States Serum Co. He was the author of one textbook on veterinary pathology and two on the diseases of swine. For a score of years he was editor of the swine department of VETERINARY MEDICINE, and from 1927 to 1938 Associate Editor of the magazine. Until physically incapacitated he held a commission of Major in the Army Veterinary Reserve.

During the past two score years, Doctor Kinsley contributed a large part to the progress of veterinary medicine in this country. Through his dominant positions, first as faculty member and then as president of the largest veterinary college in North America and later as editor of the *K. C. V. C. Bulletin* (1918-1941), he maintained an intimate contact with nearly all of the more than 1,800 graduates of that institution. The Kansas City Veterinary College transferred its records and museum to the Kansas State College in 1918. Since the latter school was Doctor Kinsley's Alma Mater, there was an added incentive for him to interest himself in its Division of Veterinary Medicine. The alumni of the Kansas City Veterinary College gave fitting recognition to his interest in both schools when at the annual meeting of the Kansas Veterinary Medical Association a year ago they presented Kansas State College with a life-size portrait of Doctor Kinsley, which now

Albert T. Kinsley, 1877-1941

hangs in the students' reading room of its Division of Veterinary Medicine.

Doctor Kinsley held an enviable position in organized veterinary medicine. He became president of the American Veterinary Medical Association in 1921, after having served in that capacity for his local and state associations and for the Missouri Valley Veterinary Association, 1909-10. Until failing health deterred him, about five years ago, he held the record for attendance at veterinary meetings. For 20 years there were few state meetings held in the Midwest or Southwest at which he was not present and contributing to the discussions. His contributions to veterinary literature over more than a quarter-century aggregate thousands of pages. His correspondence included many hundreds of letters yearly which gave advice and counsel on veterinary subjects.

He was a member of Royal Arch Masons No. 28, and a life member of Temple Lodge No. 299, A. F. and A. M., Kansas City; of Western Missouri No. 2 Consistory, A. A. S. R.; and of Ararat Temple, A. A. O. N. M. S., being also a member of the Mounted Guard of the latter organization. He was affiliated with the Church of England and with the Community Church of Kansas City.

Doctor Kinsley married Anna Louise Smith, of Burlington, Kans., September 4, 1901. He is survived by his widow and by one son, Albert Smith Kinsley, a Kansas City attorney.

John P. Turner Dies at 71

John Pollard Turner was born in Marshalton, Chester County, Pa., in 1870, and died December 7, 1941, in the Walter Reed Hospital, Washington, D. C.

John P. Turner

Doctor Turner was graduated from the University of Pennsylvania in 1890. A few months later he was appointed an Army veterinarian and assigned to the 6th U. S. Cavalry, serving in various Indian campaigns. Resigning from the Army in 1898, he was an inspector in the federal Bureau of Animal Industry for a few months and then became affiliated with the Department of Health of the District of Columbia as a dairy farm inspector. At the same time, he engaged in general practice in Washington, continuing in practice there until about a year ago. During this period he served as veterinarian to the U. S. Soldiers' Home and to St. Elizabeth's Hospital, also a Government institution. For ten years prior to its close in 1918, he was Professor of Veterinary Medicine in the Veterinary School at George Washington University.

Doctor Turner continued to be interested in improving the position of the veterinarians in the Army after he left the service. As a member of the A.V.M.A. Committee on Legislation he took an active part, first with Doctor Huidekoper and later with Doctor Hoskins, in the effort to induce Congress to pass a law granting commissioned rank to Army veterinarians, a struggle which extended over a period of fifty years before terminating successfully in 1916. In the first World War, Doctor Turner was a Major in the Veterinary Corps, and as General Veterinary Inspector of the cantonments and other posts in the Eastern area of the United States he had an important part in the organization and training of the veterinary units at these stations. In 1923, he was commissioned a Lieut. Colonel, Veterinary Reserve. He contributed an interesting chapter to Merillat and Campbell's *Veterinary Military History* on his experience in the Army during the '90's and in the World War.

Very recently, evidence has been developed indicating the possibility of wide variations in the flavin content of buttermilk. This makes it a practical necessity to assay buttermilk for riboflavin content when that vitamin is a possible factor in the ration. In fact, it would seem wise to determine the flavin content of all dairy products used in poultry rations.—*National Poultry Digest.*

* * * *

Biotin, the most recently isolated vitamin of the B-complex, is probably the most valuable substance in the world. It is available for experimental use at $3.50 for 25 micrograms—the equivalent of $62,560,000 a pound. There are only about 800 grams of biotin in pure form available at present. The first gram and a half of the substance made required the chemical treatment by a complicated process of 40,000 pounds of dried egg yolk.

* * * *

Avidin, a substance found in raw egg white, has been isolated recently at the University of Texas. It possesses the unpleasant property of inactivating biotin, a vitamin of the B-complex absolutely essential to health and life. Animals deprived of biotin, or fed raw egg white to inactivate it, develop skin lesions, have convulsions, lose weight, and die. It should be added that since avidin is destroyed by the heat of cooking, and since the yolk of an egg contains enough biotin to offset the avidin in the white, there is no danger in eating eggs, either cooked or raw.

* * * *

Of the many amino acids, over 20 have been isolated and studied. All have been found necessary for life, but they are divided into two classes. Some are known as "essential" amino acids; others are designated as "non-essential." The muscle meat of fish, animals and certain glandular organs and other animal products contain all the "essential" amino acids. Such proteins are called "complete." Proteins that are lacking in one or more "essential" amino acids are called "incomplete," and included in this group are the proteins found in grains and other plant life.—*American Nat'l Fur and Market Jnl.*

Penicillin

Penicillin, extracted from the mold *Penicillium natatum* by Prof. Florey and coworkers of Oxford University,[1] has been shown by them to be "the most powerful germ-killer both inside and outside the body . . . it is both the strongest and safest germ-killer yet discovered . . . it can be given by mouth or injected directly into the vein." It is produced in powder and in liquid form.

Lancet (London)[2] says of penicillin that its bacteriostatic action on pathogenic organisms resembles the sulfonomide drugs, but with the following differences: (1) The bacteriostatic power of penicillin against streptococci and staphylococci is much greater. Saturated solutions of sulfapyridine and sulfathiazole show no complete inhibition on an assay plate, whereas penicillin at 1:500,000 gives an appreciable clear zone. (2) The action of penicillin on streptococci and staphylococci, unlike that of the sulfonamides, is influenced to a minor extent only by the number of bacteria present. Even when several million of these bacteria are present in 1cc of medium their multiplication is completely inhibited by penicillin in as low a concentration as 1:1,000,000, while in heavily infected wounds the sulfonamide drugs seem to have but little effect. (3) In suppurating wounds the bacteriostatic power of penicillin against streptococci and staphylococci, unlike that of the sulfonamides, is not antagonized by hydrolytic protein breakdown products nor by products of tissue autolysis or pus.

[3] Even in an intensity of 1:500 it does not appear to affect leucocyte activity *in vitro*; the leucocytes remaining completely active in any concentration of penicillin likely to be reached after intravenous injection.

This bacteriostatic agent has been tried in local applications on the central nervous system and cerebral tissue of rabbits with no seeming ill effects. After a subcutaneous injection of 400 units, there was no activity in the blood of the rabbit, but the same dosage given to a cat produced blood that was antibacterial for at least 1½ hours. The reaction in man resembled that in the cat. When penicillin is subsequently secreted through the urine it still has a high antibacterial titer.

Abraham and colleagues believe that penicillin is an effective type of chemotherapeutic agent with properties not possessed by any other antibacterial substance—low toxicity to tissue cells and powerful bacteriostatic action. Body fluids and pus do not interfere with its action.

The British Medical Journal,[4] known for its cautious attitude, has gone so far as to say, "Penicillin is to other antiseptics what radium is to other metals."

Penicillin differs from bacteriophage in that it inhibits or stops the growth of gram-positive bacteria, while bacteriophage is parasitic to ordinary organisms and causes their dissolution. Bacteriophage created a stir in medical circles in the early 1920's,[5] but the popularity of this agent has dwindled to very moderate proportions. It is to be hoped that penicillin will bear out the predictions for its extensive bacteriostatic usefulness.

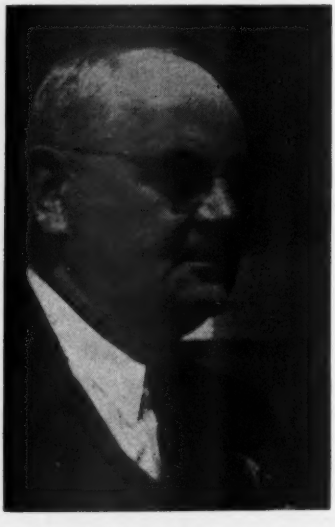
Penicillin at present is available only in small quantities, because of the scarcity of Penicillium mold, but other possible sources are being investigated and chemical research is being carried on in the hope that the substance may be produced synthetically on a commercial scale.

Another bacteriostatic agent,[6] not yet named, also has been discovered recently by research men of Oxford University. This too has been obtained from a mold, probably one belonging to the genus Aspergillus. Test-tube experiments with this agent indicate that it may have a bacteriostatic effect not only on gram-positive bacteria (the group inhibited by penicillin) but also upon the gram-negative group, which includes the organisms responsible for Shiga dysentery, typhoid, paratyphoid and cholera. It is not yet known whether this agent[7] is related to that found by a scientist of John Hopkins Hospital in *Aspergillus flavus*.

[1] *Science*, Supplement, Nov. 21, 1941, pp. 9-10.
[2] *Lancet*, Aug. 16, 1941, p. 177.
[3] *J.A.M.A.*, Nov. 15, 1941, p. 1739.
[4] *British Medical Journal*, Sept. 13, 1941, p. 386.
[5] *Vet. Med.*, Oct., 1926, p. 502.
[6] *Nature*, Oct. 18, 1941.
[7] *Science News Letter*, Nov. 29, 1941, p. 341.

45th Annual Meeting of the U.S.L.S.S.A.

THE 45th annual meeting of the United States Live Stock Sanitary Association was held in Chicago December 3, 4 and 5, 1941. As usual, it attracted a good attendance. E. A. Crossman, Cambridge, Mass., who headed the organization during 1941, presided at the three-day session. At the election of officers R. A. Hendershott, Trenton, N. J., was added to the succession, so that the official roster for 1942 is: I. S. McAdory, Auburn, Ala., president; W. H. Hendricks, Salt Lake City, Utah, 1st vice-president; J. M. Sutton, Atlanta, Ga., 2nd vice-president; R. A. Hendershott, 3rd vice-president; and Mark Welsh, College Park, Md., continuing as secretary-treasurer.



E. A. Crossman, Dean of the School of Veterinary Medicine, Middlesex University; President of the United States Live Stock Sanitary Association, 1941

Many interesting and important discussions were presented at the meeting. While the deliberations of this association are concerned mainly with veterinary sanitary police matters, they contain much of interest to all branches of the veterinary profession; the more so as such a large percentage of practitioners and federal employees are engaged whole or part time in carrying out disease prevention, control, or eradication measures.

The following paragraphs are excerpted from discussions at the meeting. The authors should not be held to an accountability that is too strict, since necessarily these statements are separated from their contexts.

Disease Control in Britain and Eire

Adolph Eichhorn, Washington, D. C., told of six weeks spent in Europe during the late summer and early fall of 1941. He was sent

Adolph Eichhorn has been Director of the Bureau of Animal Industry's Animal Disease Station at Beltsville, Md., since 1938. His outstanding contributions to veterinary science were recognized at the 78th annual meeting of the A. V. M. A. last summer, when he was awarded the XII International Veterinary Congress prize

by the federal Bureau of Animal Industry for advisory consultation with the Ministry of Agriculture of Great Britain on matters of disease control. The organization of the public veterinary service in Britain is unlike that in the United States. The sanitary police authority is vested in the Ministry of Agriculture, and the investigation of infectious diseases is a prerogative of the research council of the Ministry. The council is divided into committees for the various types of diseases. The Ministry institutes regulatory measures for the control of infectious diseases on the basis of the findings of the research council.

Eichhorn met in consultation with several of these committees, among others the committee on bovine abortion. This disease is more serious in Britain than in the United States; 40% of all herds and a large percentage of the animals in these herds being infected. Twenty-eight years ago, live Brucella vaccine was used in Britain; no attempt having been made to determine the virulence of the organism. Probably the widespread infection in that country can be traced to this practice.

Very little progress was made in the control of abortion until they began using the McEwen strain of Brucella organisms for vaccination. The research council has conducted an investigation as to the virulence and merits of strain No. 19. They proved it to be of reduced virulence but of high immunizing value—one injection conferring a solid immunity.

It is the intention of the United States B. A. I. to supply a technician to Britain to assist in initiating the use of this strain, which has been so universally adopted in this country. All cows and heifers—not just the non-pregnant—will be vaccinated. The aim is to secure increased milk production. Bovine brucellosis and mastitis are responsible for a reduction of about 18% in milk production in Britain. If the loss due to these diseases can be reduced to 10%, it will increase the value of the milk production of that country by $500,000,000 annually.

When gramicidin is used for mastitis it must be used as directed and reports must be made to the research council by the users. There is nothing that can be called a specific for this disease. Immediate results are what are being considered.

Foot-and-mouth disease in Ireland is difficult of eradication because of sabotage and also because of the fact that the virus occurs in bone marrow and even frozen carcasses may carry it for months, so that beef from the Argentine, where foot-and-mouth disease exists, can carry the disease to countries that import it.

Germany seems to have found a rather successful vaccine for the prevention of foot-and-mouth disease, but Britain has not —probably because a different strain of the virus is used in Britain to produce the vaccine.

Britain has no organization analogous to our federal bureau of Animal Industry. It is doubtful that we shall be placed in a like quandary in a similar emergency.

Tuberculosis

There is nothing in the war against tuberculosis that approaches in accomplishments that of the veterinary profession in the eradication of bovine tuberculosis, according to J. A. Myers, M.D., Minneapolis, Minn. To control tuberculosis in man, protection must be had against tuberculosis in cattle, for the bovine organism is capable of producing the disease in man. Formerly 25% of human tuberculosis was due to bovine infection. Because of the bovine tuberculosis eradication program, now well on the way to conclusion, there are at present few such cases in man. For the past five years Minnesota has tabulated the mortality rate of tuberculosis in man in every county. The locations of the heaviest foci of infection are now known. The state plans to institute modified accredited areas for human tuberculosis in the same manner as has been done so successfully in the eradication of the bovine disease.

R. A. Hendershott, Chief, New Jersey B. A. I., Trenton, N. J.; 3rd Vice-President, U. S. L. S. S. A.

W. A. Hagan, Dean, New York State Veterinary College at Cornell University, Ithaca, N. Y.

In Britain 35% of all cattle are infected with tuberculosis. The incidence of the bovine type in man is high there. The bovine type is extremely destructive to man.

R. A. Hendershott, Trenton, N. J., reported on the value of blood examinations in the diagnosis of bovine tuberculosis. In making these examinations a subcutaneous injection of 2cc of tuberculin is made, and a blood sample is collected 24 hours later and treated with sodium oxalate. A smear is then made and stained by Giemsa's method. A reaction is characterized by an increase in neutrophiles and a decrease in lymphocytes; the former may increase to 70% above and the latter decrease to 20% of the normal. The two lines — the neutrophilic ascending and the lymphocytic descending —cross each other about six hours after the injection of the tuberculin. There is no change in the neutrophilic-lymphocytic ratio when the test is applied to a non-tuberculous animal.

The tuberculin is necessary to stimulate the cytological reaction: Hendershott does not believe that the injection of a foreign protein alone will stimulate it.

In the discussion that followed, Hendershott stated that in his opinion the subcutaneous tuberculin test is even more discerning than the intradermic test. In reply to a question he said that he had had one cow that reacted to the intradermic test but did not react to the blood test. On necropsy she exhibited no lesions.

He suggested that veterinarians not familiar with the blood test acquaint themselves with it by first applying the test on several known reactors.

The "no visible lesion case" problem in tuberculosis eradication was discussed by W. A. Hagan, Ithaca, N. Y. He stated that in his opinion it will take more energy and funds to mop up bovine tuberculosis than has already been expended; in other words, that the program of tuberculosis eradication is probably only about 50% completed. He believes that in the future, laboratory examinations must supplement the usual Bureau of Animal Industry autopsy to establish a diagnosis accurately. Some animals not tuberculous have a transitory sensitiveness to tuberculin. Although the actual number of no-lesion reactors has decreased, the percentage of them has increased.

Reasons given by Hagan for the no-lesion reaction include infection with the human and avian tubercle bacilli and with the organism of Johne's disease. The most frequent cause of these false reactions, however, is infection with the almost universally distributed acid-fast bacilli of the saprophytic type present in the soil. There are

CONFERENCES WERE FREQUENT AT THE MEETING

Left to Right: Mark Welsh, Secretary; I. S. McAdory, President, 1942; E. T. Faulder, State Veterinarian, Albany, N. Y.; W. E. Cotton, Alabama Polytechnic Institute, Auburn

frequently no lesions in these latter infections, but there is sensitization to mammalian tuberculin.

Methods of diagnosing tuberculosis in the future must be more accurate, according to Hagan, or we shall be paying for tuberculosis long after it has been eliminated.

Equine Breeding Hygiene

W. W. Dimock, Lexington, Ky., stated that 25% of 4000 mares examined by him by bacteriological methods, were barren because of streptococcic infections of the genital tract. Further, 25% of all navel-ill cases were due to streptococcic infections which entered through the external genital tract of the mare. Sanitation must be relied upon for the control of streptococcic infections causing abortion, sterility and navel-ill.

There is a type of infectious abortion in mares which is due to a filterable virus. It is widespread, quite prevalent, and highly contagious when it gains access to a band of mares. In this type of abortion the mare makes no preparation for foaling — she doesn't even miss a mouthful of feed. The abortions occur from the sixth month of pregnancy to full term. The aborted foals are bacteriologically negative. Multiple pinhead gray-white spots on the liver of the fetus—really necrotic areas—are diagnostic lesions. In these areas intranuclear inclusion bodies may be found by ordinary tissue staining. Dimock has made a tissue vaccine which seems to be an effective preventive of this type of abortion. It is given intradermally in three doses of 0.5cc each, at intervals of seven days.

W. W. Dimock, Lexington, Ky. Doctor Dimock is the president-elect of the American Veterinary Medical Association

Infectious Equine Encephalomyelitis

Col. R. A. Kelser, V.C., Washington, D. C., discussing equine encephalomyelitis and its

Col. Raymond A. Kelser, Chief of Veterinary Division, Surgeon General's Office, War Department

control, stated that during the past decade it has been the most important equine disease in this country. However, equine encephalomyelitis is a misnomer, since the virus is widely distributed in the animal kingdom.

In 1938 there were 185,000 cases of encephalomyelitis in horses, with a mortality of approximately 25% from the western type and 85 to 95% from the eastern type. For some time the different types of this disease were separated geographically; the western type was found only west and the eastern type only east of the Appalachian mountains. A couple of years ago both strains of viruses were found in Alabama, and during the past summer the eastern virus appeared near Brownsville, Texas, the farthest west it has been found.

Equine encephalomyelitis is a filterable virus disease and was believed by many to be spread through contaminated water and food. However, there are a number of reasons why that mode of transmission can be questioned.

The author, when he first started work on the disease at the Army Medical School, prepared a map on which the foci of the disease were spotted. This showed that the contagion seems to follow natural water courses and irrigation ditches; also that it continues throughout the summer but disappears with the coming of frost.

Investigation of an epidemic of the disease at Ft. Benning, Ga., in 1929, indicated that it occurred after a flood. When the water had receded, Army animals were turned out on the recently inundated area and soon became infected. At that time the disease was called forage poisoning.

It will be recalled that in 1912 the Kansas horse plague occurred after heavy rains followed by sultry weather, which favored the formation of mold; which was then thought to be the cause of the disease.

Yellow fever, dengue, and other diseases are transmitted by mosquitoes. In 1932 the ability of the mosquito to transmit encephalomyelitis to guinea pigs and horses was demonstrated by the author at the Army Medical School, and both there and at Harvard Medical School efforts to produce the disease by contact yielded entirely negative results. Many things point to the mosquito as the vector. Some mosquitoes transmit only one type of infection, while others are responsible for the transmission of several diseases. Ten known species, all Aedes, transmit encephalomyelitis. This is the same genus that transmits yellow fever and dengue.

The flight range of the *Aedes sollitans* is 40 miles but it will usually stay close to where the eggs are laid; that of the *Aedes vexans* of the Colorado River valley is 30 miles.

Infection by the mosquito is more certain than by artificial injection of virus. Tests have been made of subcutaneous injection of western virus but it was only occasionally effective; but mosquitoes will invariably infect with the infection occurring more quickly than artificial means. It is not known why this should be the case. Possibly some change in the virus may occur in the mosquito to make the infection more virulent; or the accompanying salivary secretion may affect it.

There was considerable speculation on the question of susceptibility of birds to the disease. In 1933 Giltner and Shahan found

pigeons to be susceptible. In 1938 Tyzzer, Sellards, and Bennett, at Harvard, found the virus in the ring-necked pheasant. In 1938 Fothergill and Dingle found the pigeon naturally infected. Sparrows and cow birds were found by Davis to be susceptible to direct mosquito and also to artificial infection. Cox, Jellison, and Hughes found the virus in nerve tissue and in the spleen (consequently in the blood) of the prairie chicken. Birds are fed upon extensively by mosquitoes, and many may prove to carry the virus of encephalomyelitis.

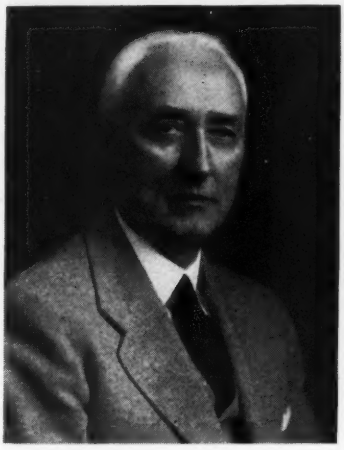
Hammon and his associates, on the basis of studies of antibodies in blood, have found evidence of a large variety of species susceptible to equine encephalomyelitis. Antibodies have been demonstrated in the blood of man, dogs, cattle, and other mammals. In Panama the author observed that *Aedes taeniorhynchus* will bite a dog in preference to a man.

After the virus of yellow fever was found to be transmitted by the mosquito, 30 years elapsed before naturally-infected mosquitoes were found in endemic areas. Hammon, three months ago, announced the isolation of the virus of both equine encephalomyelitis and St. Louis encephalitis from naturally-infected *Culex tarsalis*.

In the Colorado, Minnesota, and Canadian outbreaks of encephalomyelitis there were approximately 3000 cases among persons. The epidemiology of these outbreaks is definitely in line with mosquito transmission. The disease occurred more often in males than females; there was no contact spread in families where the disease appeared; there was no history of contact between affected horses and man—all seem to point to mosquito bites as the source of infection.

Kitselman and Grundmann, of Kansas, in 1940 reported the isolation of the western strain of equine encephalomyelitis from naturally-infected *Triatoma sanguisuga* (assassin bug), which apparently in one case transmitted the disease by placing susceptible guinea pigs and insects in the same cage. From an epizootiological standpoint, however, transmission by Triatoma cannot be considered of importance when it comes to extensive outbreaks. The important insect vector is the mosquito.

In 1938 there were 185,000 cases of equine encephalomyelitis among civilian horses. About 40 cases occurred among Army animals. Chick vaccine was used on approximately 3,500 military animals. In 1939 all Army animals (about 35,000) were vaccinated. In 1940 again some 35,000 were vaccinated, the dose being 10cc subcutaneously, repeated in one week. In 1941 approximately 50,000 were vaccinated, 1cc being given intradermally, followed a week later by the same dose. There have been no cases of encephalomyelitis among the animals properly injected. One horse at Fort Brown was vaccinated with the western virus, but not the eastern, at a time when it was in the incubation period of an attack of the eastern type of the disease; this was the only fatality.

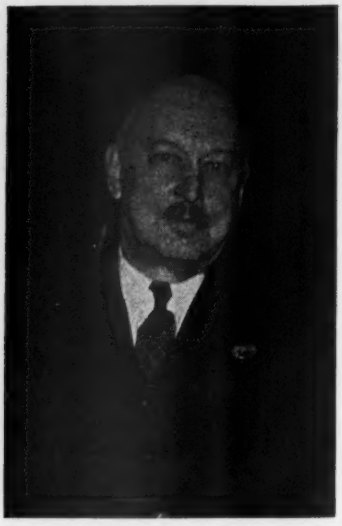


R. R. Dykstra, Dean of the Division of Veterinary Medicine, Kansas State College, was an attentive auditor at the meeting

To date the Veterinary Corps of the Army has administered approximately 123,500 double doses of prophylactic treatments with chick tissue vaccine. As previously indicated, such vaccination has been highly efficacious in protecting animals against natural infection.

Only a relatively few reactions were experienced—a much smaller number than reported among civilian animals. Few reactions which occurred in the Army were of severe types. Several cases of a true anaphylactic character, coming on within an

hour of the injection of the vaccine, occurred. These readily responded to adrenalin. Then, there were a few cases of allergic



John R. Mohler, Chief of the Bureau of Animal Industry, U. S. Department of Agriculture

reactions characterized by development within 24 hours of relatively large edematous swellings at the site of inoculation. Some cases of urticaria were observed. There were also several cases which showed general systemic reactions. One or two animals were lost, and on autopsy extensive degenerative changes were found in the liver. There were also several cases in which symptoms developed 30 days or longer after vaccination; of these, the most outstanding symptom was that of partial paralysis of the posterior quarters. None of these cases, however, showed any elevation of temperature, and in no instance was virus recovered. It should be emphasized that the number of untoward reactions in the Army as a whole was so small as to be of no consequence.

Conclusions

1. Equine encephalomyelitis of epidemic type is a virus disease in which the important common mode of transmission is through the agency of mosquitoes.

2. Other modes of infection, or other vectors, are possibly of importance in perpetuating the virus in nature and producing occasional cases but are of minor importance in common outbreaks as observed in this country.

3. Control and prevention of the disease, then, involves anti-mosquito measures or immunization of susceptible animals.

4. Animals can be rendered highly immune to the disease through vaccination with a properly prepared vaccine — chick tissue type. Two intradermic doses of 1cc each (2cc each if bivalent vaccine) produces protection for at least one year.

Undulant Fever

H. M. Guilford, M.D., Madison, Wis., reported on undulant fever in Wisconsin. He said that this disease is predominantly a male infection. In 60% of their cases, the patients had consumed only raw milk. Why more persons in past years did not contract undulant fever was explained on the basis of individual immunity and low virulence of some strains, which require heavy or mass infections to cause the disease. It was felt that pasteurization of milk in all cities of Wisconsin would reduce the annual total of undulant fever in that state by 40%.

Bovine Brucellosis

John R. Mohler, Washington, D. C., presented a report on bovine brucellosis work, including calfhood vaccination. The report indicated that of 7,700,000 cattle tested during the past year, 2.4% showed infection. This is the lowest annual percentage since the work began in 1934, when it was 10%. In most of the states there is a cooperative plan with the federal Bureau of Animal Industry for calfhood vaccination as an adjunct to the test and slaughter method.

The experimental studies conducted by the Bureau now include 13,888 vaccinated animals. In this group 96.7% of the calvings were normal. Tests of these cows have indicated a high degree of resistance to infection.

The Bureau distributes only "smooth" cultures of strain No. 19 to the licensed manufacturers of Brucella vaccine. It has no fear that strain No. 19 will increase in virulence. There is some evidence that it may lose, gradually, some of its already low virulence.

GILTNER: "WHY IDENTIFY HER—SHE IS INNOCENT!"
Left to Right: I. Forest Huddleson, East Lansing, Mich.; A. J. Glover, Editor of *Hoard's Dairyman*, Ft. Atkinson, Wisc.; Hadleigh Marsh, Bozeman, Mont.; Wm. E. Cotton, Auburn, Ala.; Ward Giltner, East Lansing, Mich.; Harry Caldwell, Wheaton, Ill.; Milt Miller, West Salem, Ohio; R. R. Birch, Ithaca, N. Y.; A. E. Wight, Washington, D. C.

Bovine Brucellosis Forum

Because of the keen interest in bovine brucellosis, a forum was organized for the discussion of that subject. Ward Giltner, East Lansing, Mich., with I. Forest Huddleson, East Lansing; A. J. Glover, Ft. Atkinson, Wisc.; Hadleigh Marsh, Bozeman, Mont.; Wm. E. Cotton, Auburn, Ala.; Harry Caldwell, Wheaton, Ill.; Milt Miller, West Salem, Ohio; R. R. Birch, Ithaca, N. Y.; and A. E. Wight, Washington, D. C., as assistants, took the stage to answer questions propounded by the audience. Some of the questions and answers follow:

Answering a question as to duration of infection in newborn calves, Cotton said that nearly all calves get rid of infection soon after birth. Colostrum has antibodies that get into the blood of calves, and if any quarter of the udder contains Brucella organisms they get into the digestive tract of the calf but are eliminated shortly through natural processes. The calf is not a carrier.

To a question as to the probable duration of immunity following vaccination, Wight had no answer. Cotton said that there is fairly good evidence that immunity will last through the third pregnancy, though undoubtedly it tapers off after the first pregnancy.

To the next question, "Will rough colonies of strain No. 19 that produce no agglutinin produce an immunity?" Adolph Eichhorn replied (from the audience) that the attitude in regard to the smooth strain is justified and that the rough strain is probably useless. Huddleson added that the rough strain is not pathogenic.

What are the effects, if any, on vaccinating with strain No. 19 calves less than three months of age? Eichhorn said the immunity will probably be transient.

Replying to a question as to the advisability of calf vaccination in certified herds, Wight said that on the range it is the custom to vaccinate calves because such sanitary conditions and care as are obtainable in dairy herds are not practicable on the range. Miller added that he thinks vaccination an excellent practice in certified herds. The owner must understand the situation and have the calves segregated during vaccination and during the reaction period.

What are the chances of spreading abortion in herds as a result of vaccinating mature animals? Eichhorn said there is no danger from the use of strain No. 19.

Under what conditions and in what herds is vaccination of mature animals advisable? Wight replied, "In problem herds."

What is the most practical method of identifying animals that have been vaccinated? This question was referred to mem-

bers of the audience. D. H. Ricks, Oklahoma City, told of the method used in his state: a tattoo of O.V. (Oklahoma Vaccinated), combined with the month (designated by the letters A to L), and the year. For instance, May, 1940, would be: OVE40. The identification method used in Louisiana is a "U" punch in each ear. Several other methods were described. R. M. Gow, Denver, Colo., remarked that he thought it unnecessary to identify vaccinated calves. Chairman Giltner summed up the situation by inquiring, "Why identify them—they are innocent!"

V. S. Larson, Madison, Wisc., said that he found the best way of encouraging continued accreditation of herds is to make breeders realize that it is to their interest, because buyers seek out the clean herds. This is done in Wisconsin, and most of the herds there are clean. (Giltner: "What about the backward states—the other 47?")

How should a state protect itself against the introduction of infection? R. A. Hendershott, Trenton, N. J., stated that the New Jersey requirement is: All cattle imported must have been tested not less than 30 days prior to entry in the state; then they are retested within 30 days. This plan seems to be effective, as 30,000 cows are imported annually into New Jersey, and there are few reactors.

Is an 18-months-old open, vaccinated heifer a spreader? Cotton said that an animal not bred and a reactor because of vaccination with strain No. 19 is not dangerous as a spreader; if the reaction is due to other than strain No. 19, she is dangerous. Birch said that scientific evidence shows that she usually will not spread the disease, but that wider experience in sanitary control indicates that it's dangerous to move cattle from herds that contain reactors into those that do not; then too, the supposedly open heifer may actually be pregnant, and hence a potential spreader.

Harry W. Schoening, Chief, Pathological Division, Bureau of Animal Industry, U. S. Department of Agriculture; Chairman of the Committee on Rabies of the U. S. L. S. S. A.

A. J. DeFosset, Columbus, Ohio, President of the National Association of B. A. I. Veterinarians, 1941. At the annual meeting of the N. A. B. A. I. V., Dec. 4th, O. W. Seher, St. Louis, Mo., was elected president for 1942. F. A. Imler continues as secretary-treasurer

In answer to the question, "Is a three-month interval between tests a safeguard against transfer of infection from herd to herd?" Birch replied: "The interval is no protection if the animal has been in contact with reactors during that period—it is partial, but not complete protection if she has not been in contact with reactors."

Glover, answering the question, "Should there be a distinction between breeding cattle and show cattle in formulating regulations?" was inclined to think that care should be taken to avoid hazards. Miller said that a distinction should be made, because there is too much red tape for show cattle; but nothing should be done to jeopardize the projected program. He thought that it should be known whether the ani-

mals are diseased or whether a reaction is due to vaccine. He has certified to more than three million dollars for indemnity, and is positive that it should be known which is an infection and which a vaccine reaction. B. J. Killham, East Lansing, Mich., stated that the unbred heifer is not a spreader of brucellosis—but how are stock show officials to know that a given heifer is unbred?

Wight volunteered the information that the federal government pays no indemnity until 18 months after vaccination; and none on animals vaccinated after they are eight months of age.

Speaking of indemnity, a member said he has had goat herds accredited through the same tests as for cows, but got no indemnity for reactors. Asked about the B. A. I. program in regard to goats, Eichhorn stated that the government has no program, though in some states testing is required.

Should calves be tested before and after vaccination? Birch replied, "There would seem to be little point in testing calves before vaccination if the intention is to vaccinate regardless of the result. The test following vaccination is merely a check on the vaccine. It is exceedingly important to test the whole herd before advising vaccination; and it is important that the tests continue in all herds under the vaccination plan." Ferguson, Lake Geneva, Wisc., insisted that the blood test before vaccination is a hardship on the veterinarian and the owner, as neither can afford the several trips necessary. He advised that the patron be instructed in the proper care (such as removal of the calf from its mother and from any other source of infection) so that when ready to be vaccinated it will be in good condition. He has found that only one in a thousand calves react to the blood test. C. P. Bishop, Harrisburg, Pa., was inclined to agree. E. A. Watson, Hull, Quebec, stated that calves should be tested a month or two after vaccination to obtain information as to whether or not they have been immunized.

L. F. Rettger, New Haven, Conn., stated that calves are not really reactors because of infection, but because of soluble antigens or agglutinins obtained from the milk. Occasionally a calf is truly infected, but this is because of outside contamination.

Asked whether persons who react to the skin or agglutination test for brucellosis should be employed about cows or in a dairy where raw milk is sold, Huddleson said that persons carrying the Brucella infection are potential sources of infection for clean herds because the germ is in the urine and feces, and sometimes these are promiscuously deposited. (Such patients are not dangerous to other persons because there is no contact transmission.) If the person has recovered, there is no danger. Perhaps 99% of veterinarians, after practicing among dairy herds for three or four years, become sensitized to the Brucella group, and an allergic reaction follows any skin test for the disease. This reaction is often lasting and serious, but must be distinguished from true infection. With strain No. 19, accidental inoculation is likely to be serious; resulting in a persisting allergic reaction—not undulant fever. A practicing veterinarian should not allow a physician to give him the skin test, as it may have serious results. Other methods of diagnosis, such as the blood test, should be used.

J. L. Axby (below), State Veterinarian, Indianapolis, Ind., Chairman of the Committee on Legislation

John W. Connaway (above), University of Missouri, Columbia, Mo., a veteran member of the association, in a letter, spoke briefly on its origin and gave some reminiscences of its first meeting

How about the vaccination of mature cows? A. B. Crawford, Beltsville, Md., said that in vaccinating adult cows there is a reduction in amount of milk produced for about four or five days, then it returns to normal. Cotton said that he found vaccina-

tion of mature cows interferes with the test and slaughter plan. (Some seemed to think it well worth while on that account alone.)

Arthur F. Schalk, Ohio State University, Columbus, Ohio, Chairman of the Committee on Meat and Milk Hygiene

A. J. DeFosset, Columbus, O., stated that farmers want indemnities, and that therefore he discourages vaccination of mature animals, especially as they may be sold and an indemnity claimed in the new location. W. H. Hendricks, Salt Lake City, Utah, said that in that state they permit vaccination of open heifers and lactating cows where there is a heavy infection in the herd, but that they keep such vaccinated herds under quarantine.

Ferguson says the livest question is whether vaccination with strain No. 19 confers an immunity on mature cows. That is what the farmer wants to know. Of course it would have been impolitic to answer in the affirmative. Perhaps that is why the question was not answered.

Hog Cholera

William H. Boynton, Berkeley, Calif., discussed: "Immunological Studies with Hog Cholera Tissue Vaccine, with a Note on a New Method of Diagnosis." He stated that a single 10cc dose of B. T. V. protects an animal for four months, but one-half this dose protects for six months; the smaller dose being more effective than the larger. Intracutaneous vaccination with B. T. V. seems to be of value, but the results are still inconclusive. In contradistinction to serum-virus vaccination, B. T. V. does not activate concurrent infections.

Gallbladder scrapings stained by the Kinsley method show what appear to be intracellular inclusion bodies in cholera-infected animals. This may be a future method of diagnosis.

Poultry Disease Control

P. P. Levine, Ithaca, N. Y., discussed chemotherapy in the control of avian coccidiosis. He stated that 0.7% of sulfapyridine in mash showed a decided coccidiostatic action against *Eimeria praecox* and *Eimeria hagani*. However, the same effect is not always observed on other strains of coccidia. Sulphur, 5% in the feed, is effective against *Eimeria tenella* and *Eimeria necatrix*, but otherwise is ineffective. It is also rachitogenic. Sulfathiazole, 1.5%, is the same in its action on coccidia as sulphur. It is slightly toxic, but not rachitogenic. Sulfaguanidine, 0.5 to 1.5%, is only slightly toxic, is effective against all strains of coccidia, and is the best of all chemicals tried. The administration of all these drugs must precede infection; they are valueless after infection has taken place. Sanitation is still of greatest importance, and the drugs are only adjuncts for

H. J. Stafseth, Michigan State College, East Lansing, Mich., Chairman of the Committee on Transmissible Diseases of Poultry

the prevention of the diseases in those birds in a flock that are not already infected.

F. R. Beaudette spoke on the reasons for failures in immunization against laryngotracheitis and pox. He pointed out that no plan of sanitation will control pox because

F. R. Beaudette, New Brunswick, N. J.

the mosquito and wild birds spread the disease. Neither will sanitation control laryngotracheitis, because the disease is perpetuated by carriers, and they are very difficult of detection. Errors in diagnosis by clinical means are responsible for apparent failure of pox vaccination to immunize. Actual failure to immunize may be caused by the use of vaccine which has lost its potency through aging.

The birds should be at least one month old when vaccinated against fowl pox, and the vaccination must be practiced at least one month before egg production begins. If no "takes" are observed at the end of 10 days, the birds should be revaccinated. During the reaction from vaccination, birds are more than ordinarily susceptible to blackhead, coccidiosis, and fowl paralysis. It takes at least four weeks for immunity to be established after fowl pox vaccination.

Except in pigeons, for which it is best, pigeon-pox virus does not produce an immunity as solid as that produced by fowl pox virus, and is to be used only in emergencies. Turkey-pox virus is much stronger than either the fowl or pigeon-pox. In turkeys, fowl pox virus does not always confer a solid immunity, and pigeon-pox virus is of even less value.

Ducks and geese cannot be artificially infected with pox virus, though some manufacturers of vaccine recommend their vaccination.

In laryngotracheitis vaccination some birds do not take. In a few days those that did take start to spread vent infection, and the mortality among the unprotected birds is very high. This is erroneously referred to as "breaks."

N. F. Waters, East Lansing, Mich., discussed the application of genetic principles in the control of disease. He stated that there is a genetic influence for every phenomenon of life. He recognized the importance of environment, however, saying that the level of resistance to disease can be altered by many environmental factors. There is, he said, some basis for the belief that pathogenic organisms, including viruses, are affected by genetic influences in a manner comparable to the higher organisms. The inheritance of resistance to pathogens is in accordance with the Mendelian principle.

Rabies

Experimental studies on the treatment of wounds in rabies were reported by Howard J. Shaughnessey, Chicago, Ill. In these studies 20% green soap solution, fuming nitric acid, and tincture of iodine were used. The treatment was applied 30 minutes after inoculation of the virus into guinea pigs. The results were that 16% of the controls; 82.5% of the soap-treated animals; 70% of the nitric acid-treated, and 60% of the iodine-treated, recovered. They also treated rabies inoculated wounds with anti-rabies serum injections, using 1cc on each of three successive days, with the following results: 50% of the controls recovered; 95% of the animals treated 24 hours later recovered; 90% of those treated after 48 hours recovered.

Human Encephalitis Due to the Virus of Equine Encephalomyelitis*

By CARL M. EKLUND, M. D.
Senior Epidemiologist
Division of Preventable Diseases
Minnesota Department of Health

BEFORE discussing human encephalitis of the equine type, brief mention should be made of what is included under the name "encephalitis." The term covers a variety of unrelated diseases which can be roughly divided into two groups; those that occur sporadically,—following various immunization procedures, such as smallpox vaccination or rabies immunization, infectious diseases such as measles and mumps, or from the use of certain drugs and exposure to lead compounds—and those that occur in epidemic form. These have aroused the greater interest. Three infectious types are recognized in the United States.

Lethargic Encephalitis

Lethargic encephalitis was first noted in France and Roumania in 1915. Von Economo's study of the Vienna outbreak of the winter of 1916-17 established it as a definite clinical entity and gave it its name. The disease appeared in this country in 1918 and many cases were reported during the winter months of the 1920's. This disease has a varied clinical picture, many sequelae and often runs a protracted course. Von Economo states that 40% of the patients died, 20% suffered serious sequelae, 26% recovered with defects and only 14% made complete recoveries. Lethargic encephalitis with its serious prognosis is the disease both physicians and the laity refer to as encephalitis or "sleeping sickness." No etiologic agent has been established.

St. Louis Encephalitis

St. Louis encephalitis first appeared in Paris, Illinois, in 1932. Severe outbreaks occurred in St. Louis during the summers of 1933 and 1937. It was the first epidemic of encephalitis for which an etiologic agent was established. A filterable virus was isolated in 1933. This type is widespread in the United States, however no large outbreaks have occurred since 1937.

Equine Type of Encephalitis

The equine type of encephalitis, caused in man by the eastern and western strains of equine encephalomyelitis virus, was definitely established in 1938 by the isolation of these strains of virus.

Lethargic encephalitis in its epidemic form is a winter disease, the other two types are summer diseases. There has been much speculation as to whether these diseases, all three recognized but recently, represent new diseases or are old diseases not formerly recognized.

Equine encephalomyelitis is believed by many to be an old disease dating back 70 or more years and during that time confused with other equine diseases. If any disease of this sort did occur in man it has been so effectively buried under other diagnoses that it is impossible to find any evidence of it. The history of the discovery of the virus by Meyer, Haring and Howitt in 1930 and of the isolation in the east of a strain of virus by Ten Broeck, and by Giltner and Shahan in 1933 is familiar to all as is the demonstration by them that this virus differs serologically from the type isolated in the west. Thus came about the terms "eastern" and "western" strains. The isolation last spring of the eastern strain in Texas has made the terms "eastern" and "western" strains less appropriate.

Although Karl Meyer, in 1932, reported three cases of encephalitis in persons who had been closely associated with sick horses at a time when extensive outbreaks occurred among horses in various sections of the country, up to 1937 there was no increased incidence of human encephalitis in the same areas. In 1937 more than 47,000 horses were reported affected in Minnesota. In a northwestern county of that state,

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where the disease was prevalent among horses, there were six cases in humans, two of whom died. Autopsy of one showed microscopic evidence of encephalitis. Blood was obtained from three survivors and Ten Broeck found that the blood of one neutralized the western strain of equine virus.

In 1938, epidemics of encephalitis occurred in many parts of the country. In Massachusetts it was recognized in horses for the first time and shortly humans were affected. Thirty-four cases were recognized. The eastern strain of virus was isolated from the brains of several fatal cases. There was a high incidence in children (66% were under the age of 10), a mortality of 73%, and sequelae in the survivors such as mental retardation and paralysis. At the same time during a California outbreak the western strain of virus was isolated from the brain of a child and later from the blood serum of an adult. Sera of encephalitis cases of that year and of other years were studied by means of the neutralization test. Twenty-nine were found positive, mainly 1937 and 1938 cases. Some sera, however, were from cases as far back as 1935. It is of interest to know that serum, obtained from one of Meyer's cases, who had had the disease seven years previously, was still weakly positive.

In addition to California and Massachusetts, the disease occurred in Minnesota, North Dakota, and Saskatchewan. In Minnesota during the summer, 36 cases of encephalitis were reported, in 14 of which the diagnoses were established by neutralization tests. In southern Saskatchewan 29 cases were found and but one case gave a positive neutralization test. However, in 1939 virus was isolated from the brain of a patient dying in the epidemic area of the previous year.

In 1939 and 1940 cases among both humans and horses generally were uncommon. However, in Kern County, California, there were 46 cases in 1939 and 48 in 1940. Nearly all gave positive neutralization tests. In the Yakima Valley, Washington, 31 cases were reported in 1939 and 86 cases in 1940. The 1940 cases were peculiar in that so many had sera neutralizing both the western and the St. Louis strains of viruses. Over 25% of the controls also neutralized the St. Louis virus. The investigators believe that mixed infections of both viruses must have occurred, but study of their data shows that, in comparison with the control series, there has been a marked increase in sera showing neutralization of the western strains of equine virus, while it is doubtful that the neutralization of the St. Louis virus was increased. In most cases it probably represented past exposure to the virus.

During the summer of 1940 a small outbreak occurred in northern Colorado among both humans and horses. The symptoms presented were those usually associated with the disease caused by the western strain of equine virus, but neutralization tests indicated that the St. Louis virus was the most likely cause both in the human and equine cases. Cox and his associates of the Rocky Mountain spotted fever laboratory, who made these tests, showed that horses are susceptible to intracranial inoculation with

During the past decade human encephalitis and equine encephalomyelitis have sprung into prominence as major disease problems. At least two of the encephalitic viruses are pathogenic for both horses and man. It is therefore necessary for the veterinarian to take cognizance of the public health aspects of the equine disease, and for the public health worker to enlist the veterinarian's aid, to the end that an effective attack on the problem may be carried out.

the St. Louis virus and that the symptoms produced in the horse cannot be distinguished from those caused by the western strain of virus.

During the past summer the most extensive outbreak of acute encephalitis on record occurred in this country. By the middle of September the cases were as follows: North Dakota was highest with 1080 cases and 96 deaths, an incidence of 167 per 100,000. In Minnesota there were 851 cases and 65 deaths; an incidence of 38 per 100,000. Leake of the United States Public Health Service states that 434 cases occurred in Manitoba, about the same number in Saskatchewan, 180 in South Dakota, and 250 in Nebraska. The mortality among these cases has varied from 8 to 16%. All seem to be a part of one epidemic. Herald Cox, of the United States Public Health Service, has isolated the western strain of virus from several brain specimens, and at the Minnesota Department of Health it has been isolated from three brain specimens and many positive neutralization tests have been obtained. Workers at the Rockefeller Institute have isolated the western strain from a Canadian case and have had positive complement fixation tests on sera from both Canadian and Colorado cases. Cox and the Division of Veterinary Medicine at the University of Minnesota have isolated similar strains from horses. To date it appears that the St. Louis virus has played a minor role in this outbreak.

The clinical picture in human encephalitis of the western type resembles the St. Louis disease closely. There is usually an abrupt onset with severe headache and high fever, together with chills, chilly sensations, nausea, or vomiting, pain in the neck, the back, the abdomen or in the extremities. In young children the onset is sudden with high fever and convulsions. A day or two after onset drowsiness appears, the temperature continues to be elevated. The patient becomes mentally slow and when not disturbed drops off to sleep. Shortly, tremors about the mouth and hands are apt to appear. Delirium and disorientation take place in severe cases. In some cases, drowsiness progresses to coma. Stiff neck is the most frequent finding, but absent abdominal reflexes and tremors of the lips, tongue and hands are common. Other findings, although less frequent, are positive Kernig and Babinski signs, changes in the tendon reflexes, difficulty in speech or swallowing and nystagmus. Sequelae are rather uncommon except in children. Mental retardation and paralysis sometimes occur.

Geographical Location	Reported Western Cases	Incidence 1941 Rate per 100,000
Prairie Country		
1. Minnesota	1937, 1938, 1941	38
2. North Dakota	1938, 1941	167
3. Saskatchewan	1938, 1939, 1941	
4. South Dakota	1941	28
5. Montana	1938, 1941	12
6. Manitoba	1941	66
7. Nebraska	1941	19
Irrigated Areas		
8. California	1935, 1937, 1938, 1939, 1940	
9. Washington	1939, 1940	

The temperature is high for about five days, then it drops quickly. About two days after the temperature declines the symptoms ameliorate and in 10-14 days the patient is well on the road to recovery. In fatal cases, the fever continues high, drowsiness progresses to coma and death usually occurs in 5-7 days.

The mortality appears to be about 10%, although 7 to 20% have been reported.

In a typical case a diagnosis of encephalitis is not difficult but it is impossible to state whether it is the St. Louis or equine type. It is often difficult to differentiate this disease from abortive poliomyelitis or tuberculous meningitis and, when there are no neurological findings, from the common infectious diseases such as undulant fever. An etiological diagnosis can often be made. The virus itself is most often isolated from the brain at autopsy. It has rarely been isolated from the blood or spinal fluid. Most often the diagnosis is made by the neutralization test in which a series of 10-fold dilutions of virus are made. Virus suspensions diluted 1000, 10,000 and 100,000 times are mixed with equal amounts of the patient's serum and groups of mice are inoculated intracerebrally. If the patient has had the disease, the mice will be protected. Serum may have protective power as early as one week after onset of the disease. The time when the

serum has its maximum protective power is not known, but when taken at the end of the second or third week will probably in most cases show protection. Protective antibodies have been demonstrated in the sera of patients two years after recovery from the disease and it is possible that they may persist longer. Patients with no history of encephalitis, seldom have sera which show protection so that a positive neutralization test, together with the clinical finding of encephalitis, justifies a diagnosis of encephalitis of the equine type. It is preferable, where possible, to secure blood serum early, and demonstrate that antibodies were not present early in the disease, but developed during the illness or convalescence. To date complement fixation tests have been used by Rockefeller Institute workers only. This test offers a quick and apparently reliable method of diagnosis.

The general type of pathology in lethargic encephalitis, St. Louis encephalitis, and the equine type is the same; differences consist chiefly in the degree and extent of involvement. The severity of the lesions is greatest in the equine type.

1. Lethargic Encephalitis
   a. Winter disease
   b. Greatest incidence in ages 15 to 45
   c. Contact spread (?)
   d. Mortality 40%; Sequelae 46%
2. St. Louis Encephalitis
   a. Summer disease
   b. Incidence increases with age
   c. Transmission: mosquitoes (?)
   d. Mortality 20%; Sequelae rare
3. Equine Encephalitis
   a. Summer disease
   b. Males predominate, all ages affected
   c. Transmission: mosquitoes (?)
   d. Mortality 10% (?); Sequelae uncommon

Grossly, the surface of the brain is injected; on section petechial hemorrhages may be found. Microscopically, the most striking features are the cellular infiltrates which are perivascular, nodular and diffuse and they may be found in the cortex, midbrain, brain stem and upper cord. In some brains large numbers of polymorphonuclear cells may be seen. Also there are various degrees of nerve cell destruction and there may be small areas of hemorrhage and perivascular degeneration.

The manner in which the virus spreads in this disease is not clear. In the human disease the following observations have been made. Outbreaks have been limited to agricultural areas. Within these areas the disease appears simultaneously at widely separated points. Contact between the cases is seldom established nor is there usually more than one case to a family. Attendants of cases, such as nurses and physicians, seem to have no increased incidence of the disease. History of close contact with a sick horse occasionally occurs but in most cases such history is not found. In most epidemics no particular age group is affected. In California, two outbreaks have been reported in which 50 to 60% of the cases were persons under ten, but this is contrary to the usual experience. Males were affected more often than females. This sex difference is most pronounced in the age group 15 to 55, in which about 70% of the cases were males. The disease always occurs in summer with its peak usually in August. The above observations can be explained readily by the assumption of insect transmission, while attributing spread to contact necessitates the assumption of a great number of carriers for which no evidence has been found. Similar results in the early study of the disease in horses led to the assumption of insect spread and resulted in the study of the possible role of mosquitoes.

Minnesota Encephalitis Cases—July 1, 1941 to Sept. 30, 1941, Inclusive

Age Group	Total Cases	Per Cent Male
Under 1	16	56.3
1	9	44.4
2	10	50.0
3	2	50.0
4	4	100.0
5-9	23	47.8
10-14	66	63.6
15-19	81	82.7
20-24	70	74.3
25-29	58	77.6
30-34	68	77.9
35-39	35	68.6
40-44	41	90.2
45-49	35	68.6
50-54	39	76.9
55-59	51	56.9
60-64	59	62.7
65 and over	91	59.3
Unknown	93	61.3
Total	851	68.7

Since 1933, ten varieties of Aedes mosquitoes have been found able to transmit one or more of the equine viruses. Eight of these can transmit the western strain and seven the eastern strain. Five of the varieties transmitting the western strain have been found in Minnesota. In laboratory experiments, mosquitoes are allowed to feed on suspensions of infected brains or on animals at a time when virus is present in the

blood stream. In about one week after this feeding, the mosquitoes can transmit the disease to a susceptible animal. Infection has been transmitted to mice, guinea pigs, birds and horses. There is no reason to believe that the Aedes mosquitoes cannot transmit the disease from horse to horse in the field or between horses and man, but such a simple chain of transmission cannot explain the entire spread of the disease. The difficulties are:

1. Aedes mosquitoes found in Minnesota cannot survive over winter as adults and there is no evidence of transmission from generation to generation through the egg. Such mosquitoes must be infected each season and cannot be looked upon as a permanent reservoir of infection. Hammon has recently reported the isolation of the western strain of virus from *Culex tarsalis* caught in the field. To date there is no report that this mosquito can transmit infection. It is found west of the Mississippi and is especially common in the west coast states. In this area at least it does not appear capable of explaining the entire spread of virus. Riley and associates in surveys in the Minneapolis area found it to be much less frequent than *Aedes vexans* and it did not appear to feed frequently on man. Birds seem to be the preferred hosts. Also, the problem of survival of virus over winter does not appear to be solved by the discovery of infection in this insect. Although survival of this mosquito over winter probably occurs in the adult stage it remains to be shown that it can carry infection over winter.

2. The horse has virus in the blood stream for a short time only early in the disease. There is no evidence of a chronic carrier state or that the horse can carry the virus over from one season to the next. In order to find the reservoir for the virus a large number of mammals and birds have been examined. The eastern strain has been isolated from the brain of a pigeon and from pheasants and the western strain was recently isolated by the United States Public Health Service from a prairie chicken. These isolations were made during periods when outbreaks were occurring among both humans and horses.

In addition to searching for virus, the susceptibility to inoculation of various species of animals through several routes has been tested. The following list of mammals and birds includes those which have been shown susceptible to inoculation with the western strain: Calf, goat, vole, white footed and field mice, kangaroo and wood rats, Richardson's ground squirrel, puppy, cottontail rabbit, pigeon, burrowing owl, guinea fowl, domestic mallard duck, Gambel and English sparrow, thrasher, valley quail, junco, turkey and chicken. Chicks up to five weeks are very susceptible, but pullets and old hens vary in susceptibility. This incomplete list indicates the wide host range of the virus. In addition to testing in the laboratory to find the susceptibility of animals, Hammon and co-workers have bled a variety of domestic and wild animals in the State of Washington and have found antibodies in the blood serum of the cow, dog, goat, horse, pig, sheep, field mouse, white footed mouse, weasel, chicken, duck (domestic mallard), pekin duck, domestic goose, great horned owl, domestic pigeon, turkey, red shafted flicker, sparrow hawk, killdeer, ring-necked pheasant, California quail and robin. Ten Broeck and Howitt had previously demonstrated antibodies in turkeys and chickens. Howitt has raised the question of the significance of antibodies in chickens as she reports that she has demonstrated them in chickens raised under conditions precluding infection. Eastern virus has been isolated from the blood of birds of various species experimentally infected that have shown no evidence of disease. This was done over a period of a few days only.

These results indicate that a wide spread is possible when the virus is once established in an area; however, in none of these animals has a chronic carrier state been demonstrated. To serve as a permanent reservoir an animal of wide distribution must be postulated. It must be one not too susceptible to the disease and one which harbors the virus for long periods in some blood rich organ such as the spleen, liver or bone marrow; or there must be a relationship such as obtains in plague, where the rat and flea are continually passing the infection back and forth between them-

selves. Because the disease appears over such wide area simultaneously it has been assumed by some that a bird would be the most likely reservoir. Ten Broeck was apparently the first one to present this theory following the study of the disease in the horse. The possibility of the virus persisting over winter in ticks has been suggested and work has been presented to show that the tick *Dermacentor andersoni* can harbor and transmit the western virus and can also transmit it from generation to generation in the tick itself. This work needs confirmation and could not account for spread in large areas. Conenose bugs have been found infected in nature in Kansas and have been shown able to transmit the disease to guinea pigs; however, this bug is not found in many areas where the disease has been prevalent.

The relationship of the disease in horses to the disease in man is obscure. In California according to Howitt the big outbreaks among horses occurred during 1930, 1931, and 1932, at which time human cases did not appear to be unusually prevalent. Most human cases were recognized during 1937, 1938, 1939 at a time when the disease in horses was not as prevalent. In Minnesota during 1937, over 47,000 horses were affected. Six human cases were recognized. It is very possible that cases of human encephalitis were missed but it is not believed any great epidemic was overlooked. In 1938, about 25,000 horses were affected and 36 human cases reported. The past summer, while the incidence among horses was higher than in 1939 and 1940, it was low compared with 1937 and 1938, yet the incidence among humans was very high. Reports from North Dakota indicate a similar experience. It is probable that immunization and previous exposure to the disease have cut down the incidence in horses greatly. It is evident that an extensive outbreak of the disease in horses may not be accompanied by epidemic appearance in humans and that many cases among humans may be coincident with only a moderate number among horses. When the disease was first diagnosed in horses, the virus did not appear to have much virulence for man, or it may be that the vector spreading the disease among horses did not often attack man. In recent years the virus may have spread to new hosts, passage through which has enhanced its virulence for man or to a host that has insect vectors that attack man frequently.

The eastern type of this disease was recognized among horses in 1933, but no human cases were recognized until 1938, although Ten Broeck had long been interested in the possibility of human infection. It may be significant that 1938 was the first year that virus was isolated from pheasants and a pigeon.

At present the problem of spread in the disease is still that of finding the reservoir host and establishing insect vectors by finding them infected in the field.

Before closing I wish to mention the recent developments in the study of the St. Louis type of encephalitis, since they so closely parallel those in human encephalitis of the equine type.

1. Horses are susceptible to experimental inoculation and one outbreak among horses was apparently due to this virus.

2. Hammon's studies of the neutralizing power of sera from many domestic and wild animals indicate wide exposure to this virus.

3. Hammon states that he has isolated the St. Louis virus from *Culex tarsalis* mosquitoes in the State of Washington.

4. Studies of Howitt in California and Hammon and Howitt in Washington show that in many cases sera neutralize both the western virus and the St. Louis virus.

These observations need to be confirmed and close study should be made of all epidemics involving both the horse and man.

Discussion of therapy and immunization has been left out since there is as yet no demonstration of the value of any specific therapy in man, and no refined vaccine for human use has been generally available.

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Veterinary Medicine and Public Health*

By DAVID J. DAVIS, M.D., Chicago, Illinois
College of Medicine, University of Illinois

THE field of public health is rapidly involving all medicine, including especially the human-animal diseases. The transmission of disease may be most intricate, often concerning several different animals as hosts, carriers, or victims.

Years ago we learned that in order to control or eradicate an infectious disease in man, it is necessary to attack it on all fronts. For example, if tuberculosis or syphilis continues to exist in one race or group or stratum of society, all individuals sooner or later are endangered thereby. So it is with the human-animal diseases. As a rule, in order to eradicate them completely in man, it is necessary to direct the attack against all the animals known to be infected or to be carriers.

In this paper several of the more important human-animal diseases are reviewed briefly, with particular attention to recent advances in measures designed for their control and eradication.

Rabies

In contrast with some of the other human-animal diseases, rabies dates back over two thousand years. It still remains a serious health problem in spite of the fact that Pasteur 60 years ago told the world how to eradicate it. Primarily it has been a problem of the stray dog, in which it is enzootic. From time to time it spreads to other animals. Some 10 years ago it spread in the west to wolves and coyotes, which then attacked deer, cattle, and even children. Last year an epizootic of rabies sprang up among the foxes in Georgia and has since moved west and south. Already considerable livestock has been lost from the bites of the rabid animals, and 30 or more human beings have been exposed.

In 1937 the International Health Board, cooperating with the Alabama Board of Health, undertook studies on the epidemiology of rabies and also on the problem of immunization. Their work thus far has shown that vaccine properly prepared according to any one of several methods will afford some protection in dogs. A practical and universal protective immunity, however, has so far not been achieved.

Tuberculosis

In tuberculosis the control measures have been so satisfactory that we are apt to become indifferent and overly confident. In spite of the fact that tuberculosis has receded until there are now only one-fifth as many human cases as in 1900, this disease still afflicts its millions and continues to exist in cattle, hogs, poultry and perhaps in other animals. The potential dangers still lurking in tuberculosis are not to be minimized or neglected.

Bubonic Plague

Bubonic plague has continued to make steady progress in its distribution in spite of 40 years of research and legislation since it first entered the San Francisco area, presumably from Hong Kong. Its range now extends from California toward the east and north, at present including Montana, North Dakota, Colorado, Washington and Alberta. Only this last summer two fatal

The stray dog is the rabies infection pool

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human cases were reported from California.

This disease seems permanently enzootic in rats, ground squirrels, and marmots, from which it is disseminated chiefly by the flea.

From the public health standpoint, bubonic plague is one of our major dangers. From time to time we may expect it to emerge from the lower animals to cause human outbreaks of the bubonic and pneumonic forms, as it has done in the past. Constant vigilance is necessary.

Trichinosis

An interesting series of papers on trichinosis has been published recently by the National Institute of Health. They deal chiefly with the incidence and the epidemiological aspects of this disease. The most recent report concerns the examination of 3000 diaphragms from routine human autopsies, chiefly in and about Washington, D. C. Approximately 15% of the diaphragms were positive. This percentage emphasizes the magnitude of the problem of trichinosis as well as its seriousness. From the health viewpoint, these studies are pertinent in that they point to the proper treatment of garbage as at least one of the significant preventive measures.

Tularemia

Tularemia continues as a serious infection in many localities, especially in the Midwest. The number of human cases reported is increasing.

Campaigns of education as regards the handling of the rabbits and other animals are clearly indicated. Because of the large number of susceptible lower animals this disease presents great difficulties from the public health standpoint. Susceptible animals include man, rabbits, sheep, grouse, water rats, squirrels, muskrats and opossums. This infection affords another example of the extreme difficulties encountered in the control of diseases prevalent in a large variety of wild animals.

The control of trichinosis in man depends upon the elimination of the practice of feeding raw garbage to swine

Actinobacillosis

This infection is known to exist in cattle throughout the world. Sheep also are commonly affected, especially in Montana and the West. According to present data, actinobacillosis is rare in human beings, but it has occurred occasionally, with fatal results. In this connection the question presents itself: Do these few human cases mark the beginning of a wider distribution, or are they more or less accidental or sporadic manifestations of this disease? Until this question is answered, every case and all outbreaks will bear careful scrutiny.

Listerellosis

Another human-animal disease just looming upon the horizon, as it were, is the Listerella infection. The specific organism has now been isolated from naturally-infected rabbits, foxes, cattle, sheep, goats, guinea pigs, hens, and men. Graham has published important studies on the disease in sheep and cattle, and Pons and Julianelle on the human disease.

Infectious mononucleosis in man is the disease formerly known as glandular fever. Its cause has never been determined. It is an acute infection accompanied by severe sore throat, fever, and changes in the blood, which reveals large numbers of mononuclear leucocytes. The culture of Listerella from the blood of a typical case of infectious mononucleosis by Julianelle is sugges-

tive that there may be a causal relation.

This disease again is an example of a well-known human malady now being approached from the veterinary side. Further observations on these cases should prove interesting.

Streptococcic and Staphylococcic Udder Infections

The udder of the cow continues to be a source of danger for man. This danger has been greatly curtailed by special tests in the cow and by the pasteurization of milk. However, certain streptococci virulent for man and causing such diseases as scarlet fever and septic sore throat find their way into the cow's udder at times and produce there a mastitis.

Certain staphylococci with the peculiar property of generating toxins may gain access to the udder and give rise to outbreaks of food poisoning. The cooperation of veterinarians with public health officials is especially necessary in the control of these two types of infection.

Infectious Encephalitis

Just now there comes from James P. Leake, Medical Director of the United States Public Health Service, a report on the northwest epidemic of infectious encephalitis.[1] He states that the largest of all human epidemics on record has just ended. There were 1,080 cases in North Dakota, 815 in Minnesota, 180 in South Dakota, 434 in Manitoba, 64 in Montana, and 250 in Nebraska, mortality ranging roughly from 8 to 16%.

The western equine type of virus seems to have been implicated in most of the cases, but the St. Louis type was found in some instances. The western virus was found in horses, man, and the prairie chicken. Cox makes a special report on finding the virus in the prairie chicken for the first time coincident with a human epidemic. This may be correlated with the isolation of the eastern strain of virus from pheasants and pigeons in Massachusetts.

The serum neutralization test for antibodies is being used to detect possible hosts for the virus. Many species of animals, both domestic and wild, including several avian species, have given positive reactions to this test. The significance of these findings has not yet been evaluated, and final conclusions must await further data.

Encephalitis is now one of our major health problems, involving as it does lower animals, human beings, and possible insect vectors. Much has been learned about it, but as in the case of poliomyelitis, the mode of transmission is still obscure. A more exciting episode in the drama of disease control seldom has been experienced. It is safe to predict a continuation of the drama next year.

Summary

The few human-animal diseases cited here serve to emphasize the struggle proceeding on an extensive scale in nature, involving animals, both high and low, in most complicated systems and cycles; struggles that often terminate in the destruction of vast numbers of individuals and at times even threaten the existence of a species.

[1] *Public Health Reports*, Sept. 26, 1941.

Further study is needed on the possible public health significance of actinobacillosis and listerellosis in sheep and other animals

The Effect of Phenothiazine on the Hemoglobin Concentration, Erythrocyte Count and Leucocyte Count of Swine

By ERNEST C. McCULLOCH and LEE SEGHETTI
State College of Washington, Pullman, Washington

THE toxicity of phenothiazine for vertebrates has been controversial since Smith and Haller[1] in 1934 found it to be very toxic to culicine mosquito larvae. The following year Smith, Munger and Siegler[2] found it to be effective against the codling moth. The earlier reports indicated the drug to be an excellent anthelmintic against certain nematode parasites, without toxicity to the hosts in therapeutic doses, and reasonably safe even when enormous amounts were given. More recently there have been a number of reports of toxic symptoms following the administration of therapeutic doses of phenothiazine.[3, 4, 5, 6, 7, 8, 9] Others have presented evidence which cannot be ignored that certain lots of phenothiazine have been toxic for certain groups of horses. It should be kept in mind that some of these reports are based on observations, rather than on carefully controlled experiments, and that in the majority of instances no thorough examination of the animal had been made prior to medication. It should be remembered also that large numbers of animals receive therapeutic doses of phenothiazine each day and that deleterious results are so rare as to be considered worthy of record. However, the ratio between the recorded instances of suspected phenothiazine poisoning and the total number of doses of the drug administered cannot provide a basis for an accurate estimate of the relative safety of the drug because (a) the administration of the drug may not have been responsible for all the reported morbidity and mortality during the days following medication, and (b) many clearly indicated instances of phenothiazine poisoning may have escaped record due to the failure of the attending veterinarians to report them.

One approach to the determination of the toxicity of phenothiazine, and hence a basis for ascertaining the ratio between the therapeutic and toxic doses, is to repeat for many consecutive days the maximum single therapeutic dose, or even greater amounts, to animals under controlled conditions, meanwhile making careful observations. The obvious weakness of data thus obtained is that, while they do provide a relatively accurate indication of the ability of the animals under experiment to tolerate repeated overdosing with the drug, they do not aid in determining the incidence of animals which may possess an idiosyncrasy against it, nor do they indicate those pathological or physiological conditions which may render an animal especially susceptible. These data must await more thorough studies of animals showing toxic symptoms following phenothiazine medication. Each instance of phenothiazine poisoning should be reported, and each report should contain a complete description of the animal, the

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* From the Division of Veterinary Science. Published as scientific paper No. 497, College of Agriculture and Experiment Station, State College of Washington.

[1] Smith, L. E. and H. L. Haller, 1934. Insecticidal tests of synthetic organic compounds—chiefly tests of sulphur compounds against culicine mosquito larvae. *Jnl. Econ. Entom.* 27, pp. 1176-1185.

[2] Smith, L. E., F. G. Munger and E. H. Siegler, 1935. Phenothiazine, a promising new insecticide. *Jnl. Econ. Entom.* 28, pp. 727-730.

[3] Errington, B. J. and Clifford Westerfield, 1940. Phenothiazine as an anthelmintic for horses and mules. *Vet. Med.* 35, pp. 688-693.

[4] Boley, L. E., Normal D. Levine, Wilson L. Wright and Robert Graham, 1941. Phenothiazine in the treatment of gastro-intestinal parasites of animals. Presented at the 58th Annual Meeting of the Ohio State Veterinary Medical Assn., Jan. 5, 1941.

[5] U. S. Dept. Agric. Release, March 18, 1941.

[6] Hatcher, W. L., 1941. Phenothiazine poisoning in horses. *No. Am. Vet.* 22, pp. 159-160.

[7] Errington, B. J., 1941. Phenothiazine as an equine anthelmintic. *Vet. Med.* 36, pp. 188-193.

[8] Meriweather, Bert, 1941 Phenothiazine vs. hemoglobin in chickens. *Vet. Med.* 36, 374-375.

[9] Schmit, H., T. T. Christian and W. M. Smotherman, 1941. Is phenothiazine poisonous to horses? *J. A. V. M. A.* 99, pp. 225-228.

environment and the diet before and after medication. Investigations in which animals with known pathological conditions are given therapeutic doses of phenothiazine should yield valuable information.

It is possible that obscure impurities in some lots of phenothiazine may be responsible for toxic symptoms. This may have been a factor in some of the cases reported by Errington,[7] and by Schmidt, Christian and Smotherman.[9] Also, the degree of exposure to sunlight following medication may be important, as suggested by the observations of De Eds, Wilson and Thomas[10] on orchard workers using phenothiazine sprays.

TABLE I.—EFFECT OF PHENOTHIAZINE UPON HEMOGLOBIN CONCENTRATION, ERYTHROCYTE COUNT AND LEUCOCYTE COUNT: FIRST TRIAL

	Control Pig No. 42			Pig No. 43			Pig No. 44		
Date	Hemoglobin in grams per 100cc	Erythrocytes in thousands	Leucocytes	Hemoglobin in grams per 100cc	Erythrocytes in thousands	Leucocytes	Hemoglobin in grams per 100cc	Erythrocytes in thousands	Leucocytes
9-21-40	8.58	6,270	17,900	8.73	6,900	16,500	9	6,300	20,500
9-22-40	8.78	6,330	13,700	9.1	7,700	19,800	10	7,125	15,200
9-23-40	10.1	7,190	14,400	9.9	7,340	17,800	10.5	7,000	14,200
				Given 12gm. phenothiazine daily			Given 30gm phenothiazine every 15 days		
9-28-40	8.25	6,290	14,200	8.63	6,820	17,440	9.8	7,020	15,600
10- 2-40	8.53	6,200	12,500	9.6	7,270	14,000	9.8	7,120	13,800
10- 5-40	8.78	6,700	12,400	8.35	6,740	16,100	9.9	6,300	20,300
10- 9-40	9.6	5,800	14,200	8.04	6,070	19,500	9.3	5,900	14,500
10-12-40	8.76	6,200	17,800	9.8	7,160	16,800	9.4	5,560	12,900
10-16-40	10.6	7,350	12,800	9.7	6,900	13,300	9.5	6,200	13,900
10-19-40	9.1	5,970	12,900	8.98	6,460	15,000	10.1	6,470	12,400
10-23-40	9.9	6,980	11,600	8.3	5,970	14,100	9.3	6,250	14,900
10-26-40	8.21	5,700	11,400	8.3	4,900	18,100	8	5,400	13,200
10-30-40	8.6	6,100	12,200	9.3	5,600	21,000	9.3	5,600	11,500
11- 2-40	9.3	5,200	12,500	8.1	4,250	20,300	8.94	5,700	13,700
11- 6-40	8.17	5,080	12,400	8.25	4,700	17,150	8.5	5,200	13,500
11- 9-40	8.8	5,700	11,400	9.5	5,670	18,100	9.4	5,400	13,200
11-13-40	9.4	5,760	13,300	9.5	5,890	17,300	9.1	5,260	14,300
11-16-40	9.3	6,180	14,600	9.3	5,800	18,600	9.4	5,600	16,000
11-20-40	9.4	6,090	14,500	9.6	5,660	17,600	10.3	5,670	15,400
11-23-40	9.3	6,000	14,200	8.9	6,200	17,800	9.5	5,725	14,000
11-27-40	8.7	5,600	14,000	8.3	5,560	18,200	9.5	5,840	13,400
11-30-40	8.1	5,500	13,900	8.39	6,200	18,500	9.3	6,300	12,700
12- 4-40	8.2	5,800	15,800	8.25	5,900	15,250	8.9	5,900	13,000
12- 7-40	8.7	5,600	16,200	8.83	6,100	15,500	9.8	6,030	12,500

Experimental

The pigs used in these experiments were in only reasonably good condition at the start of the trials, having been maintained since weaning in small individual pens without direct exposure to sunlight, although they received moderate exposure to an ultraviolet lamp, and were given cod-liver oil in their ration.

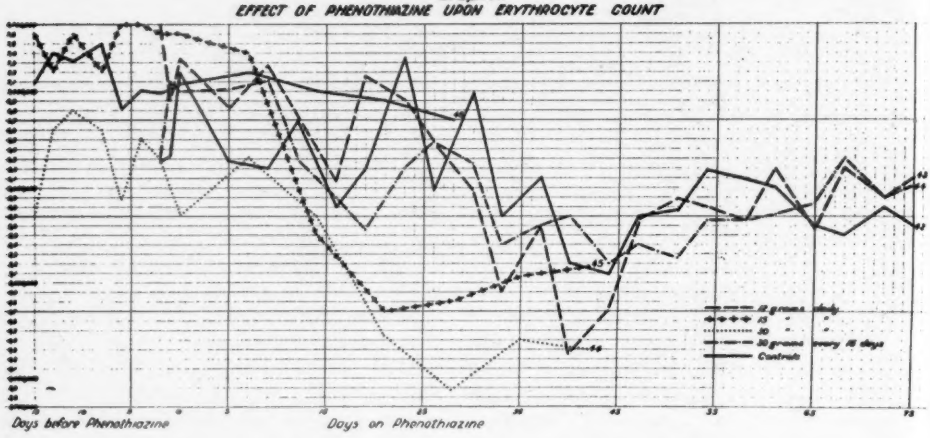
Blood samples were collected by cleaning the dorsal surface of the ear with alcohol and making a shallow cut across the marginal ear vein with a scalpel. The first blood removed was discarded. Specimens were then collected for hemoglobin determinations and for erythrocyte and leucocyte counts. Two separate samples from each animal were counted and the average taken. Hemoglobin estimations were made by the acid-hematin method, using a Klett biocolorimeter. For the cell counts, Thoma's pipettes, Hayem's solution and 1% acetic acid solution were employed. The cells were counted in a Spencer bright-line hemocytometer with improved Neubauer ruling. Throughout the experiment the samples were obtained at the same time each day.

[10] De Eds, Floyd, Robert H. Wilson and J. O. Thomas, 1940. Photosensitization by phenothiazine. *J. A. M. A.* 114, pp. 2095-2097.

First Trial

During the first trial, pig 42 served as a control. On September 21, two days before the phenothiazine medication was started on the experimental animals, this pig weighed 64 pounds. It gained 22 pounds during the 75 days the pigs were on the feeding trial. The hemoglobin concentration, erythrocyte count and leucocyte counts for this animal, as well as of the two other pigs in this trial, are included in Table I and in Graphs A and B.

Graph A.
EFFECT OF PHENOTHIAZINE UPON ERYTHROCYTE COUNT



Starting September 23, pig 43 received 12gm of finely powdered phenothiazine[11] daily for 74 consecutive days, or until December 5. This amount was selected because Swanson, Harwood and Connelly[12] had recommended 12gm as the single therapeutic dose for a pig weighing between 50 and 100 pounds. It was expected that the daily repetition of the recommended single therapeutic dose would soon prove lethal. However, the pig survived and when killed December 7 weighed 64 pounds, or two pounds more than when the overmedication was commenced, although during the 74 days of the trial, it had received a total of 888gm, or approximately 30gm of phenothiazine per kilo of body weight. The blood picture throughout the trial did not differ significantly from that of the control animal. This pig developed severe posterior paralysis 19 days after the start of the trial. It is not known whether this was the result of the phenothiazine medication. Necropsy at the conclusion of the trial did not reveal any evidence of enteritis or nephritis. Of special interest was the presence of four male Ascaris in the small intestine of this pig.

Because it was expected that pig 43 would not survive the high level of phenothiazine long enough to provide data on chronic poisoning, pig 44 was given 30gm (two and one-half times the recommended therapeutic dose) at 15-day intervals or a total of five times, commencing September 23 and ending December 6. During this period, this animal increased in weight from 64 to 109 pounds. As shown in the accompanying tables and graphs, the medication had no significant effect upon the hemoglobin concentration, erythrocyte or leucocyte counts.

Second Trial

The results of the first trial were not conclusive because pig 43, receiving the higher level of phenothiazine, had developed posterior paralysis. It was decided to feed even higher levels of phenothiazine to ascertain whether posterior paralysis would occur in other animals also. Commencing January 8, pig 44, which in the previous trial had re-

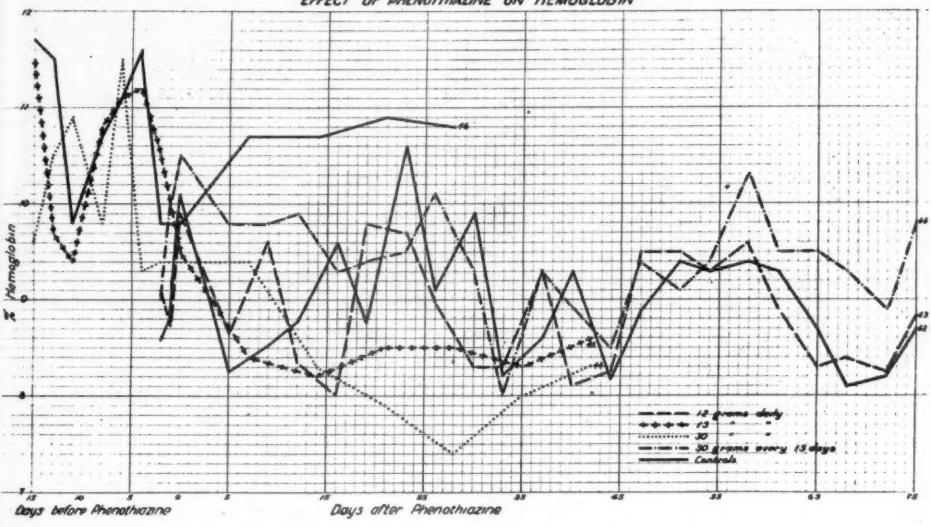
[11] Finely powdered phenothiazine supplied by E. I. du Pont de Nemours and Co. was used in the first trial.

[12] Swanson, Leonard E., Paul D. Harwood and James W. Connelly, 1940. Phenothiazine as an anthelmintic for the removal of intestinal worms from swine. *J. A. V. M. A.* 96, pp. 333-338.

ceived 30gm of the drug five times at 15-day intervals, was given 30gm each day for 42 consecutive days, or until February 18. Three ounces of a commercial suspension,[13] containing 12gm phenothiazine to each fluid ounce, was administered with a dose syringe. Because of the loss of phenothiazine in the graduate used for measuring and in the dose syringe, and the possible waste of a small amount in administering it, the data are calculated on the basis of a dose of 30gm each day. A total of 1,260gm of phenothiazine, or approximately 21gm per kilo, was given. During this period the pig gained 40 pounds, weighing 110 pounds at the start of the observation period, December 24, and 150 pounds when slaughtered on February 19. However, as shown in Table II and the accompanying graphs, the hemoglobin concentration dropped to 7.24% and the erythrocyte count to 3,870,000 per cmm. There was no apparent effect upon the leucocyte count. After slaughter, a careful examination failed to reveal gross pathological changes.

Pig. 45, which weighed 123 pounds at the start of the observation period and 145 pounds at the end of the trial, received 15gm each day, or half as much as pig 44. This was contained in the commercial suspension previously described, and the same allowance was made for a percentage being wasted. During the period of 42 days, this pig received a total of 630gm, or approximately 10gm per kilo of phenothiazine. The results, shown in Table II and Graphs A and B, indicate that the daily administration of this level of the drug significantly decreased both the hemoglobin concentration and the erythrocyte count but had no noticeable effect upon the leucocyte count. Examination after slaughter February 19 failed to reveal any significant changes. During this trial, pig 46, which served as a control, gained in weight from 117 pounds to 145 pounds.

Graph B.
EFFECT OF PHENOTHIAZINE ON HEMOGLOBIN



Discussion

The amounts of phenothiazine administered in this study were considerably greater than those fed by McNaught, Beard and De Eds,[14] who maintained rats for 42 days on a ration containing 0.25% phenothiazine.

[13] The phenothiazine suspension "Phenite," supplied by Jensen-Salsbery Laboratories, was used in the second trial.

[14] McNaught, James B., Rodney R. Beard and Floyd De Eds, 1939. Effects of sulfanilamide, phenothiazine and thionol in experimental trichinosis. *Soc. Exp. Biol. and Med.* 41, pp. 17-20.

The drug was consumed at the rate of 0.14gm per kilo per day and the average weights increased from 158 to 186.5gm during this period even though each rat had received raw meat containing 2,350 encysted hemoglobin from 88% Sahli to 94% Sahli."

Massive doses, suggestive of the amounts given pigs in this experiment, were administered to human patients by Manson-Bahr.[16] He gave 40gm of phenothiazine in a single dose to a native in India, and two other natives each were given 30gm on each of two successive days. There was no apparent effect, except that the urine was tinted pink.

TABLE II.—EFFECT OF PHENOTHIAZINE UPON HEMOGLOBIN CONCENTRATION, ERYTHROCYTE COUNT AND LEUCOCYTE COUNT: SECOND TRIAL

	Control Pig No. 46			Pig No. 45			Pig No. 44		
Date	Hemoglobin in grams per 100cc	Erythrocytes in thousands	Leucocytes	Hemoglobin in grams per 100cc	Erythrocytes in thousands	Leucocytes	Hemoglobin in grams per 100cc	Erythrocytes in thousands	Leucocytes
12-24-40	11.7	7,090	14,500	11.5	7,600	17,000	9.6	5,700	12,800
12-26-40	11.5	7,400	15,400	9.7	7,200	16,200	10.5	6,600	14,400
12-28-40	9.8	7,320	19,400	9.4	7,600	19,000	10.9	6,800	14,800
12-31-40	10.7	7,490	18,700	10.8	7,200	18,300	9.8	6,600	13,100
1- 2-41	11.1	6,820	15,500	11.1	7,700	16,500	11.5	5,970	14,500
1- 4-41	11.6	7,010	16,100	11.2	7,700	15,800	9.3	6,510	14,000
1- 6-41	9.8	6,980	17,800	10.5	7,600	16,200	9.4	6,300	13,200
1- 8-41	9.8	7,080	16,500	9.5	7,600	17,000	9.4	5,710	12,800
1-15-41	10.7	7,200	20,400	8.4	7,400	18,400	9.4	6,300	13,300
1-22-41	10.7	7,000	17,100	8.2	5,500	16,500	8.3	5,700	12,700
1-29-41	10.9	6,900	18,300	8.5	4,700	17,200	7.9	4,450	12,300
2- 5-41	10.8	6,700	18,800	8.5	4,800	18,700	7.4	3,870	12,400
2-12-41				8.3	5,060	18,000	8.0	4,400	11,400
2-18-41				8.6	5,160	16,600	8.3	4,300	11,200

Trichinella spiralis at the start of the trial. The rats on the phenothiazine diet made a gain of 18%, as compared to a gain of 20% for the controls. The experimenters stated, "There apparently were no ill effects from the continued use of this drug."

De Eds, Stockton and Thomas[15] gave phenothiazine to 31 human patients with chronic and 16 with acute infections of the urinary tract. The average daily dose was 1.33gm for an average of 7.4 days, the average total dose being 9.99gm. They found considerable individual variation in the effect of phenothiazine upon the blood picture, reporting: "Three patients developed a definite secondary anemia, the total dosage of phenothiazine being 22.4, 28.1 and 19.9gm, average 23.5gm. . . . However, two other patients, who received doses of 24.6 and 43gm of the drug, showed no diminution of erythrocytes or hemoglobin; one of these patients showed an increase of erythrocytes from 4,460,000 to 4,700,000 and in

Conclusions

The daily administration of therapeutic doses of phenothiazine, even over periods as long as ever would occur under practical conditions, was without apparent deleterious effect upon the swine used in these trials. The daily repeated administration of much larger doses over longer periods produced a marked and significant, although not a fatal, decrease in the hemoglobin concentration of the blood and in the erythrocyte count. No significant change occurred in the leucocyte count.

The data obtained in these trials, although based upon a limited number of animals, maintained under but one set of conditions, indicate that the amounts of phenothiazine usually recommended for swine possess a large factor of safety.

[15] De Eds, Floyd, A. B. Stockton and J. O. Thomas, 1939. Studies on phenothiazine: VIII. Antiseptic value of phenothiazine in urinary tract infections. *Jnl. Pharm. & Exp. Therap.* 65, pp. 353-371.

[16] Manson-Bahr, Philip, 1940. Phenothiazine as an anthelmintic in threadworm and roundworm infestations. *Lancet* 239, pp. 808-809.

Swine Erysipelas*

By FRANK BREED, Lincoln, Nebraska

SWINE erysipelas in the acute septicemic form has been recognized in the United States since about 1930. Prior to that time erysipelas had not been considered one of the major swine diseases, since it appeared relatively unimportant in this country from the standpoint of morbidity and mortality. During the years from 1930 to the present, however, this disease has been constantly on the increase. It has involved a greater number of herds within the districts where it was first recognized, and there has also been a decided extension to other areas.

Up to the present the following forms have been recognized in the United States: (1) the acute septicemic type, (2) benign urticaria (diamond skin disease), (3) chronic valvular endocarditis and arthritis, and (4) necrotic dermatitis. Besides these four recognized forms there are other types which we are not able at this time definitely to define.

Since 1930 many articles, both research and clinical, have been written on the subject. These have dealt primarily with the acute septicemic form of the disease—history, clinical symptoms, pathological changes, and the subacute and chronic sequelae of the acute outbreak. Much of this literature gives the impression that the recognition of erysipelas in the acute septicemic form is the prime factor in the control of this disease. It is becoming apparent that this is not the case; that other factors may be of as great or even greater importance. It is time for us to give more consideration to these insidious underlying factors, for we have, in the recognition and control of this disease in all its forms, one of the most difficult problems that has ever confronted our profession.

It will be necessary for practitioners, as well as those engaged in research, laboratory diagnosis, and regulatory work (state and federal), to reconsider carefully some of the problems which we have thought already solved. For years many of us have cheerfully diagnosed certain obscure conditions, especially disturbances involving the joints, as peracute hog cholera, chronic hog cholera, or nutritional deficiencies. We have not given sufficient consideration to the possibility that they might be due to a complicating factor, or that these pathological manifestations might be the unrecognized forms of another disease. Closer study of these conditions frequently reveals the presence of the erysipelas organism, and it becomes clear that a malady diagnosed as an atypical form of another disease is in reality one of the disguised forms of erysipelas.

This reconsideration will not be an easy task. It will entail the keeping of careful records; it will involve more frequent laboratory examintion of tissues; and it will require, more particularly for the practitioner, more study of the literature on these maladies, in order properly to correlate the results of laboratory tests with the condition under observation.

During the past 11 years much has been learned clinically, bacteriologically, and serologically about the diagnosis of erysipelas, and of the value in prophylaxis of specific antiserum and the living culture. Serum-culture prophylaxis is comparatively new in this country, its use so far having been confined to Nebraska and certain parts of Iowa and South Dakota. As a result of the cooperative experimental vaccination project in these states, especially Nebraska, it is now possible to raise young swine on farms where swine husbandry had ceased because of erysipelas. The federal and state authorities, together with the practitioners engaged in this work, have learned many new facts about the disease.

If erysipelas were amenable to the methods used in the control of other infections in swine, we would expect shortly to have this disease well in hand, but erysipelas differs from the major swine infections. It is an insidious disease which appears unexpectedly. It may be present on the premises and in the herd for some time before it is recognized. It is quite different from hog

* Presented at the 22nd Annual Veterinary Conference, University of Illinois, Urbana, Ill., October 14-15, 1941.

cholera, which manifests itself in a spectacular manner once it gains access to a herd. As yet not all its manifestations are known. The acute outbreaks are not difficult to diagnose, and the formation of enlarged

When skin and joint lesions manifest themselves, erysipelas is not difficult to diagnose

joints following such outbreaks are plainly and easily recognized; but when young animals react positively to the agglutination test without showing any clinical disturbance, it is evident that the problem of diagnosis is a complicated one.

There has been a decided increase in the occurrence of enlarged joints in swine received at the packing houses, particularly in the middle west. The percentage of these affected joints yielding *E. rhusiopathiae* has been unusually high; but the astounding fact is that the organisms are recovered also from swine joints which grossly show no pathological changes.

The question is frequently raised as to how young swine, two to five days old, become infected with erysipelas. In order to clarify this point, I quote from a communication received in January, 1941, from Dr. G. C. Holm, University of Idaho: "The following experience took place in a herd with which I have had close contact. One sow with a blood titer of over 1:1,200 farrowed eight pigs. Seven showed enlarged joints in two to five days, and positive blood titers of over 1:400 in five to seven days. Necropsies were performed and cultures prepared from the various organs and tissues. *E. rhusiopathiae* was recovered from some of them, while in others our cultures were negative in spite of the fact that all the pigs showed the symptoms and joint lesions of erysipelas. The pigs had been farrowed in a clean, disinfected pen, and the navels were painted at birth. The milk from this sow proved negative when injected into pigeons.

"Another sow had a blood titer of 1:800. One of her pigs developed the same type of joint lesion; on the sixth day it had a blood titer of over 1:400 and cultures were positive. The milk from this sow also was negative."

Doctor Holm feels, from his observations and bacteriological findings, that there is a possibility that these young pigs may have been infected within the uterus, although he questions the ability of *E. rhusiopathiae* to pass through the placenta. Intrauterine infection has been suggested by Waller, recently of Iowa, and also by European investigators. Evidently this mode of transmission is one of the problems we must solve if we are to control erysipelas.

Another instance in which the disease may enter a herd unsuspected and remain there for a long period before being recognized, is in herds that appear to suffer an attack of influenza in July and August. Shope states definitely that swine influenza is a disease of the fall, winter and spring months, and that attempts at experimental transmission of the disease from May to September, during two summers, yielded only negative results. Further investigation of these "summer flu" herds has in nearly every instance revealed that a goodly percentage are reactors to the agglutination test for erysipelas.

The discussion so far has dealt with erysipelas as a disease entity, and it can be seen that as such the problems raised are knotty ones. However, the real stumbling block in the control of erysipelas is the organism itself. *E. rhusiopathiae* has been studied for years by foreign scientists in both Europe and South America, but they have not set forth in literature the fundamentals of its physiology.

Two types of the organism, varying in pathogenicity and antigenicity, have been encountered. The two strains do not have

the same universality as is found in the different strains of hog cholera virus. In a few instances animals apparently protected against erysipelas by the use of culture have been found to lose this protection when placed on other infected premises. Therefore, we do not have the definite assurance, as in cholera, that animals immunized in one state will be solidly protected against the infection which may occur in another state, or even in different areas within the same state. This erratic behavior of the organism is a definite problem for future research.

It is common knowledge that the production of experimental erysipelas in swine is an exceedingly difficult task; in fact, to the best of my knowledge, during the last few years only one strain of *E. rhusiopathiae* which would produce an acute septicemia when injected into swine has been recovered. This strain was isolated by the Pathological Division of the federal Bureau of Animal Industry. According to Dr. H. W. Schoening, Chief of this Division, the culture killed quite consistently through a number of passages in swine and then lost its pathogenicity.

Another instance of the difficulty of experimental work with erysipelas was the recovery from sick and dying swine of an organism which was bacteriologically, microscopically, and serologically identical with that of erysipelas, but which was not pathogenic for pigeons, even when injected in large quantities.

The epizootiology of the disease is a phase about which we know very little. The organism is known to be passed in the urine and feces of infected animals. The tonsils probably play a part in the case of carriers, and possibly in the spread of the disease. It is not unusual to recover *E. rhusiopathiae* from cultures of scrapings from normal, healthy appearing tonsils of apparently healthy swine.

Those of us who have worked with this organism for some time, in both laboratory and field, are beginning to feel that many factors other than the presence of the organism must be involved in acute outbreaks. For example, what influence has the soil on the infectivity or pathogenicity of *E. rhusiopathiae?* This question cannot be answered definitely now, but it seems that the organism isolated from the tissues of animals either sick or dead from erysipelas infection, is not always identical in all respects to the organism contained in infective soil.

Premises which become contaminated with the erysipelas organism retain it over a long period—ten years or even longer. Animals raised on this contaminated soil develop various types of the disease. An acute outbreak may occur for one or perhaps two years. This may be followed by a number of years in which no acute outbreaks appear. During this period there may be difficulty in producing normal growth in young swine. An occasional animal may die, but there is no pronounced mortality in the herd at any given time. A few enlarged joints and stiffness of gait may be noted. At necropsy these animals may show no pathognomonic lesions. The tissues and organs may have a shrunken appearance and seem to be firm and somewhat pale. Bacteriological examination of many such tissues reveals nothing of diagnostic value; it appears that the organism has been present, caused the damage, and then disappeared. Some agglutinins are present in the blood of these animals. It is possible that the organism has secreted itself in some obscure tissue which we fail to examine, remaining dormant, so to speak, until some provocative stimulus is encountered which causes it to be active once more. In order to demonstrate erysipelas in these herds, it is only necessary to place with them a few thrifty young swine from herds where it is known the infection is not present. In a short time the latter develop acute cases which are not difficult to diagnose.

A "provocative stimulus" has been mentioned in connection with the appearance of an acute outbreak of erysipelas. It is easy to postulate such a stimulus, but difficult to discover what it may be. Observations have shown that age, a high concentration of infection in the soil, and hot, humid weather together with the lack of nutritive factors (vitamins and minerals), either singly or in combination, may constitute the provocative stimulus. However, little is known about Erysipelothrix in nature and any theory is only a guess.

An Outbreak of Ovine Rabies

By J. A. HENDERSON, Urbana, Illinois
Department of Animal Pathology and Hygiene
University of Illinois

WHILE natural outbreaks of rabies in sheep are not rare, an opportunity to follow the course of an outbreak in the field is seldom afforded the practitioner, espe-

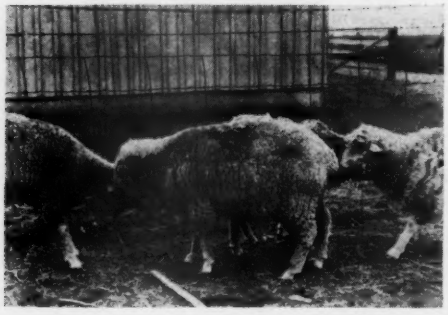


Fig. 1. Rabid ewes showing bellicose attitude

cially when relatively large numbers of animals are involved. The following report may therefore be of interest.

A flock of 835 ewes and rams and about 500 young lambs under the supervision of the Department of Animal Pathology and Hygiene was presumably attacked by one or more stray dogs on the night of March 7, 1941. The sheep had been confined in eight separate lots, but rabies later appeared in four lots containing a total of about 500 ewes and 350 lambs. Although the caretaker stayed in a shack 100 feet from the sheep pens and visited the flock every two hours during the night, he did not see the dogs.

One lamb was killed, and another died later from the effects of its wounds. Twenty-five ewes were severely bitten, 10 of them requiring treatment. The wounds were almost invariably around the lips, jaws, and nostrils, and in four ewes the frontal sinus had been penetrated.

It was supposed that the wounds had been inflicted by dogs, but the possibility of rabies was thought to be remote. There had been no evidence of rabies in the community; even when symptoms of deranged consciousness appeared in the ewes, the fact that the flock had been suffering severe losses from listerellosis at the time of the attack delayed the consideration of other diseases. However, on March 27th the shepherd reported that three ordinarily timid ewes had boldly attacked him and were manifesting other unusual symptoms. Clinical symptoms of this character called to mind the possibility

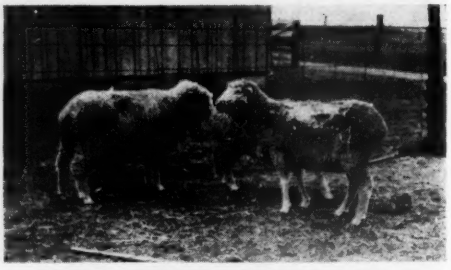


Fig. 2. Rabid sheep with patches of wool torn from their backs

of rabies and it was then noted that these ewes all had healed wounds on their faces. Several sheep were immediately destroyed, and Negri bodies were found on microscopic examination of the hippocampi. On checking with the shepherd it was learned that four ewes displaying rabid symptoms had been destroyed between March 24th and March 26th. Losses continued at the rate of four or five a day for about two weeks, then tapered off, with individual cases appearing from time to time. The last case occurred June 26th.

At the time the diagnosis of rabies was confirmed, all the mature ewes showing wounds or scars which could have been caused by the attack March 7th were placed in a separate lot. This group totaled 53. Of these, 46 died after showing typical symptoms of rabies, a mortality of 88%. In addition, a number of ewes and lambs, on which no scars or wounds could be found, died apparently of rabies. The total mortality was 60 mature ewes and 18 lambs.

There seemed to be no correlation be-

tween the severity of the bite and either the incidence of the disease or its incubation period. Some of the first ewes to show symptoms had received only slight scratches, while one of the ewes whose frontal sinus had been pierced still showed no sign of the disease at the time this report was prepared.

Symptoms.—In a great majority of the cases observed the first symptom manifested was an increase in sexual desire, shown by repeated attempts to mount other members of the flock. This was usually accompanied by a tendency to pull wool, sometimes their own, and by light butting of other sheep (Fig. 1). After about 24 hours, many of the affected ewes would charge the caretaker or other persons who happened near them. If two of them were placed together they might draw back six or eight feet from each other and come together repeatedly with great force. They became more zealous about wool pulling, and when a group at this stage was confined in a small lot, a patch of wool was soon torn from each animal (Fig. 2). Some ewes after violent exercise exhibited what were apparently temporary fainting spells. As a rule, affected animals were unable to rise one to four days after the appearance of symptoms. In those few in which the disease was allowed to run its course, death occurred within two days from the onset of locomotory paralysis.

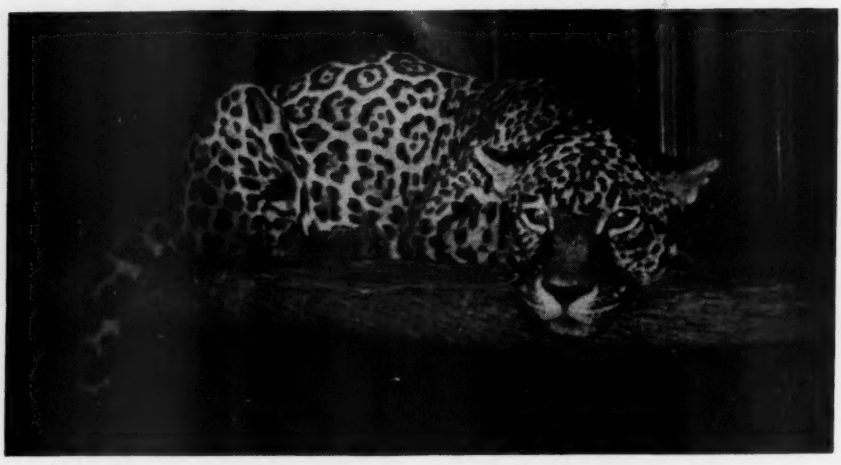
Differential Diagnosis.—Since losses from both listerellosis and rabies were occurring in this flock simultaneously, an excellent opportunity was presented to compare the clinical manifestations of these two encephalitic diseases. The differences were marked if the animal could be observed while on its feet. In listerellosis, circling, somnolence, and pressing the head against objects were observed, while sexual excitement or belligerent action did not occur. If the animals were down when the first observation was made, clinical differentiation was more difficult, and it may be that some errors in diagnosis resulted. However, it seemed that in listerellosis the clinically affected animals had more vitality and were less completely paralyzed. They moved their legs continuously as they lay on the ground, and in some cases lived three or four days after reaching the stage of inability to rise. Opisthotonos was common. On the other hand, in the paralytic recumbent stage of rabies, ewes seldom moved their legs, and opisthotonos was not observed. In rabid sheep, death invariably followed within 48 hours from the onset of locomotor paralysis.

Sheep are not infrequently attacked by rabid dogs, but the practitioner seldom has the opportunity of observing an outbreak involving large numbers of animals, such as that reported here. This report is of further interest in that it describes the differential diagnosis of rabies and listerellosis.

Animal Pathology Laboratory, University of Illinois

The Application of Zoo Experience to Small Animal Practice

By CAPTAIN S. G. STEPHAN, V.C., U. S. A.
District Veterinarian
Hilo, Hawaii



"Ben," a male Jaguar (Felis onca) in the Cincinnati Zoological Gardens

FOR five years prior to my extended active duty assignment in the U.S. Army, my professional work consisted in maintaining the physiological status of well-being among such members of the animal kingdom as are found in a zoological garden. This was at the Cincinnati Zoological Gardens, where I was associated with my grandfather, Sol A. Stephan, who today is the oldest wild animal curator, and with my father, Joseph A. Stephan, the general superintendent of the gardens.

The cash value of zoo inmates is higher than that of most animals a veterinarian is called on to treat. It may be of interest to quote some of the more recent prices. In the spring of 1939 a pair of giraffes was priced at $7,000; a baby gorilla, $10,000; a giant panda, $5,000; a pair of Siberian tigers, $5,000; a pair of snow leopards, $3,500; a pair of black leopards, $1,800; an Indian rhinoceros, $15,000; an Indian elephant, $3,000; a pair of camels, $2,500; a polar bear, $500; a shoe bill stork, $1,500; a 25-foot reticulated python, $20 per foot. In the present world situation, no wild animals are being imported, and there is no such thing as a current price list. The past season zoos merely exchanged surpluses. With no replacements of outstanding exhibits to be had, the value of the animals on hand is naturally enhanced.

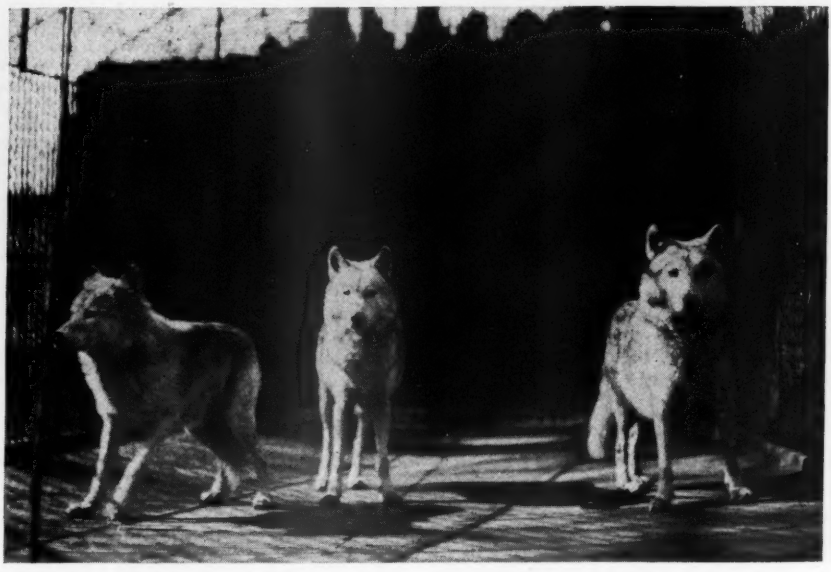
Further, the upkeep of such an institution as the Cincinnati Zoological Gardens, with some 1,800 inmates, is quite a project. With the constant refrain of zoo trustees from time immemorial—"We have no money—you must make the best of it"—it is necessary to keep the collection fit and sound for exhibition at the least possible expense. Nothing so detracts from a zoo or adds so much to adverse publicity as to have patrons leave the premises saying, "The poor beasts would be better off dead; they are underfed and emaciated." Such mouth-to-mouth advertising has closed the gates of many a zoological garden.

■ In a situation like this, with animals of high value which must be kept in good condition with the least possible expenditure, it is obviously an advantage to practice prevention rather than cure. This means rigid

supervision of exercise and careful balancing of diets.

I recall a reply my grandfather made to a question of a physiologist who stood before a cage in the carnivora building: "Sol, how can you know how much to feed a fellow like Jim, or any of the other animals, for that matter?" (Jim is a seven-year-old, full-grown male lion.)

This is used as a basis for computing his normal daily ration. We give him somewhat less than 15 pounds; about 12 to 13 pounds at each feeding. This keeps him a bit hungry following his meal, thus insuring greater activity and helping to maintain a normal routine of body functions, which is most essential to an animal so closely confined. The result is that there is no finer looking



These three gray wolves *(Canis occidentalis)* have lived together in this cage 23 years

"Jim is fed only one meat meal a day, with one feedless day a week. We choose Monday as a good day to check the diets of animals that are maturing, approaching senility, in various stages of pregnancy, etc., because it is usually a slow patron day and so there are not many to miss the feeding show. "Feeding checks" or tests are carried out two or three times a year to determine the proper amount to be fed daily to each animal. In such a test Jim, for instance, is given more than I know he will eat; say 20 pounds of meat. The first day he'll gorge it all. The next day the 20-pound meal is repeated, and again he may eat the whole meal. But when he is given another 20 pounds on the third day, he will eat only about two-thirds of it—roughly, 15 pounds.

specimen anywhere than Jim, nor one with greater fecundity or more resistance to disease."

Under such a regimen, Jim can be expected to live a long time. It often happens that the zoo inmates exceed the known longevity periods of the same species in a wild state. For example, Paul, a male lion, lived 24 years in the zoo despite his restriction to summer and winter cages no larger than the average size living room; Pasha, a lioness, lived in the carnivora building to the age of 25 years. A jaguar, Ben, is still going strong after 17 years in one cage. As for the Canidae, three gray wolves have lived together in a cage 16 x 20 feet for the past 23 years under conditions far more artificial than those of the average domestic

pet, and apparently their show-worthiness will extend for several more years. In my grandfather's opinion, they have a good chance to outlive the free members of their

According to some authorities, the family pet of today was to some extent a wild animal a few years ago. The dog, for example, is related to the wolf, if not a direct

The skulking coyote and the pedigreed Pomeranian are brothers, or rather cousins, under the skin. Perhaps milady's pampered pet would benefit from a diet more like that of his wild relative. Or have centuries of domestication changed his physique too radically?

fast-diminishing species, which is now limited to a restricted portion of the Northwest. This and other species of the larger wild Canidae are rapidly becoming extinct by reason of man's incredible persecution in giving a bounty for their tails. The longevity of such animals in our zoos therefore takes on an added importance.

■ My experiences as a veterinarian and curator at the Cincinnati Zoological Gardens have given me a new approach to the problems of a small animal practice. Many of the zoo inmates are closely related to the domestic animals, and a study of their reactions and idiosyncrasies is of considerable value in domestic zootechnics. When one knows the habits and needs of wild animals in a simulated natural habitat, one is in a better position to give advice on the diet and care of domesticated animals of related species. Among the Canidae and Felidae in the zoo are wolves, coyotes, dingoes, foxes, jackals, hyenas, African hunting dogs, cheetahs, lions, tigers, pumas, and leopards—all of them, incidentally, very intractable and difficult to restrain for treatment and care.

descendant of that animal, and in many instances is still a creature well able, barring human interference, to carry out superbly the tasks of self-maintenance.

Man has played a decisive role in the destiny of the dog. His experiments in canine breeding have been so successful that today there are over 160 distinct breeds, some of them known to the dog world for centuries, but others developed fairly recently. It is believed that cross breeding and line breeding are factors in many of the present day canine and feline disorders. Certain modern breeds exhibit increased susceptibility to various diseases; others have developed a shorter life-span.

But, in spite of artificial breeding and changes of habitat, a dog remains a dog. Up to the turn of this century man had little difficulty in feeding and caring for his pets. It is only in recent times, with the modern tendency to reconstruct all that pertains to canine care and diet, that this became a difficult task. Has man perhaps removed the dog too far from what would be his natural diet if he were living wild like the wolves and foxes? It is my opinion

that the modern dog, like his ancestors, is more carnivorous than most of us realize; that about 85% of canine maladies may be traced to an improper diet; and that more progress in correcting these maladies can be made by changing the ration to one more nearly approximating the natural canine diet than in any other way.

By applying my experiences in the zoological gardens, I have brought many pet owners to realize that diet is the most important single item in an animal's existence. I do not recommend any particular diet, even that which I feed my own dog; but I do recommend the inclusion of more meat than is usually fed.

■ The canine or feline diet should contain 85% or more meat. It is good practice to feed a two- to six-month-old dog three times a day, and one of six months to two years two meals a day; after that, one meal a day is sufficient. The amount of food should be increased gradually up to the time of maturity, relying somewhat on the animal's instincts as is done during weaning. Too often this factor is forgotten after the puppy reaches six months of age.

Some variation in the meat diet for the average household dog is essential. Variety is the spice of life; the wild animal instinctively selects a wide range of meats, and it is logical to follow the same procedure for his domesticated brother. If the dog's meat diet is made to parallel closely that of his master, sufficient variation is assured.

My present pet, a 2½-year-old Dachshund, is fed as follows:

Saturday and Sunday: Eight to ten ounces of beef liver and heart, dropped into boiling water for 10 to 15 minutes, then cut into convenient pieces, making certain that the meat is not overcooked, but rare and juicy. This is a healthful, yet convenient week-end diet.

Monday and Tuesday: Mutton, lamb, veal, or a combination of these. Neck and fore quarter cuts are more economical. They are prepared in the same way as the liver and heart; in fact, all meats should be so prepared, in order to have the outer edges partly cooked and leave the vital nutrients enclosed within. If the meat is cooked too long, many of the nutrients are boiled out—making excellent soup, to be sure, but leaving the portion to be consumed by the dog relatively tasteless and innutritious.

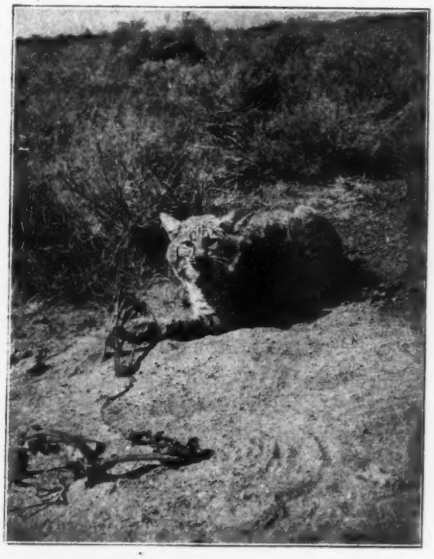
Wednesday and Thursday: Eight to ten ounces of boiled beef neck or face muscles. These are economical cuts, and ones that any butcher can supply.

Friday: A 10-cent can of sardines in oil (a good regulator) or an eight-ounce piece of baked fish.

If this or a similar diet be followed, never reducing the meat protein and always varying the ration from day to day, the number of sleepless nights and anxious days of caring for a sick animal will be greatly diminished.

It may be asked, "Why cook the meat at all?" Raw meat is the most natural feed for dogs, but over a period of years man has gone so far afield in feeding his pets that it is best to get back to the natural diet gradually. As a beginning, some raw meat can be mixed with the partly-cooked portion, or raw meat alone can be fed every other day, and I often advise this course.

■ On your next case of typical summer dermatitis, try stressing "diet" to your client, even to the extent of giving him a detailed menu to be followed strictly. At the same time, you can administer palliative treatment if necessary or psychologically desirable; but be careful not to prescribe arsenicals, sulphur derivatives, or other medicaments which may interfere with the dietary treatment outlined.



The wildcat is physiologically much like the tame

Amputation of the Penis of a Steer

September 22, 1941, a two-year-old, red grade steer was presented with the following history. The owner had purchased the animal at a community sale three months previously. At that time there was a small growth on the penis, but this was not of sufficient size to prevent retraction of the penis into the sheath. The animal had been turned out to pasture and from time to time the owner had noticed that the growth was becoming larger. When the steer was presented for treatment, the neoplasm was the size of a man's fist. It was attached to the ventral surface of the penis, but was slowly surrounding the glans and about two inches of the penis posterior to the glans. The animal urinated frequently, voiding only a small amount of fluid in three distinct streams.

The steer was cast in lateral recumbency and stretched out by means of ropes attached to the front and hind feet. The penis was withdrawn from the prepuce as far as possible, and a length of muslin bandage was tied tightly around it both to serve as a tourniquet and to allow an assistant to hold the penis out of the sheath. Attempts to locate the urethra with a catheter were unavailing, owing to the swelling and the presence of the neoplastic tissue around the glans. An area some two inches long and one inch posterior to the growth was prepared by washing with 1:500 biniodide solution, and 1% procaine solution was infiltrated. The penis was then cut squarely off. In this manner, it was possible to locate the urethra, and a catheter was passed. An incision was made ventral to the urethra, and about one inch of this structure was freed from the surrounding tissue by blunt dissection. A suture of 20-day chromic catgut was passed through the penis, ventral to the urethra and around the corpus cavernosum. In order to prevent this ligature from slipping, it was anchored to the tissue of the ventral part of the penis. The suture was then drawn tight and tied. The dependent portion of the penis anterior to the ligature was ablated, care being taken not to injure the free urethra. The urethra was anchored to the end of the penis with one suture of No. 1 catgut. (The excess urethra theoretically shrinks as repair takes place.) When the tourniquet was released, it was necessary to pick up one small artery with a hemostat and crush it. The animal was permitted to regain its feet and immediately urinated profusely. Hemorrhage was negligible, ceasing in a few minutes.

The owner was instructed to spray the area around the prepuce daily with a fly repellent to prevent myiasis. An uneventful recovery was reported.

R. B. KOGER

Woodward, Okla.

Vegetative Endocarditis in a Cow

An aged Hereford cow was found by her owner to be extremely lame in the right hind leg on September 7, 1941. He could find no apparent cause for the lameness. Complete cessation of the milk flow and inappetence were noted that day also, and he administered 2½ pounds of Epsom salt as a drench.

The writer was called the following day. The cow was down in the pasture and could be forced to rise only with difficulty. She was very weak, but when made to move showed no evidence of the lameness reported by the owner. No lesions were found in the leg, although it seemed more sensitive than normal in the region of the coronary band. Further examination revealed a temperature of 104.2° F., fast pulse, marked jugular pulse, and abnormal heart sounds.

Although no splashing heart sounds were heard, a tentative diagnosis of traumatic pericarditis was made and an unfavorable prognosis given. Upon the insistence of the owner that a tonic be administered, calcium gluconate and dextrose solution were given intravenously. During the administration of this solution a marked venous stasis was noted.

Death occurred at 7:30 a.m. the following day. A post-mortem examination revealed a cauliflower-like fibrinous growth, about the size of a quarter in diameter and ⅛-inch thick, on the right auriculoventricular valves. The spleen was greatly swollen. No other significant lesions were noted.

The internal organs were taken to the veterinary laboratory at the University of Kentucky, where cultures of the spleen yielded a Pasteurella organism.

E. L. TAYLOR

Cynthiana, Ky.

A Bovine Monster

March 31, 1941, at nine o'clock in the morning, a black five-year-old grade cow

was presented for assistance in a difficult labor.

The owner had noticed signs of labor at six o'clock the previous evening, made an examination, and found an apparently normal presentation. Traction was applied by means of a wire stretcher. One hour later he decided to call on the services of his neighbor, who suggested that a team of horses be hitched to the fetus to give greater traction. This, also, proved unsuccessful. At nine o'clock the same evening the owner called the local veterinarian. Upon examination a diagnosis of giantism was made and an embryotomy, in which the head, neck and two front limbs were removed, was performed. Further examination resulted in the discovery of another head, neck and two front limbs. The owner was then advised to take the cow to the veterinary clinic at Kansas State College because the veterinarian in charge felt unable to deliver the monster.

Shortly after presentation at the clinic a cesarean section was performed, as the genital tract was too swollen and edematous for an embryotomy. Upon incision of the uterus the monster was removed. It had the appearance of twins united at the pelvis. There were two heads, two necks and two thoraces. Six limbs, four anterior and two posterior, and a double tail were found. One

Bovine monstrosities are not uncommon, but they always excite interest. The two-headed calf above was photographed by W. G. Songer, Lincoln, Kans.; the monster at the left, by D. P. Ehlers, Butler, Pa.

set of head, neck and thorax was curved around near the body.

According to Fleming, a technical classification of the monster would be Ischiodidymus Examelus with a Comylorrhacchis Scoliosa of one trunk.

In searching for a possible explanation for such an unusual fetus the breeding record of the animal was reviewed. In both previous pregnancies the calf had been carried to term with normal parturition and no retained placenta. All three calves had been sired by the same bull, and the cow had conceived on the first service each time. Thus, no possible explanation for this condition was obtained from the breeding record.

Most authors who attempt an explanation of malformed fetuses are not agreed as to the cause of the condition. For formation of double monsters, the most logical of the theories is that the pregnancy had started as twins developing from the same ova, but due to some upset in development there was incomplete cleavage in the germinal area which caused this compound monster.

This condition has never been proved to be heritable, nor has it often recurred in the same animal. It is quite probable that it is a result of an accident in the early fetal development.

SHIRLEY L. DAVIS.

Manhattan, Kans.

Autobiography of a Veterinary Practitioner

By E. T. BAKER, Moscow Idaho

I.

Youthful Impressions

MY first impression of veterinary science was gained one cold March morning when I was about ten years of age. The place was western Pennsylvania, and the year was 1892.

When my uncle went out to the barn to do the chores, he found one of our cows stretched out on her side, looking as if each breath would be her last. She had calved the day before, and apparently had been doing fine, so that my uncle was greatly surprised.

Rushing into the house, he dispatched me over to Abel Finley's, who was the handy man on such matters in our community. When Abel arrived and examined the patient, he diagnosed the trouble as milk fever and advised us to send for "Doc" Stuchell before it was too late.

As there were no rural telephones in our section at that time, I saddled my pony and started on the cold, muddy journey of some ten miles. I was fortunate in finding "Doc" at home, and about noon he drove up, with his little team of bays covered with mud and lather.

His team was unhitched and placed in the barn, while he made a hasty examination of the patient. He confirmed Abel's diagnosis of milk fever, and decided she should be bled. Whipping out an old pen knife used for paring apples, cutting tobacco and castrating pigs, he made an incision in the jugular vein, sending me to find a long horse hair to tie up the punctured blood vessel.

"Doc" also directed large, warm bags of salt to be placed over her kidneys, and had her blanketed. He was not familiar with "blowing up the bag," which later came into vogue, but had to depend on other curative measures. About this time, my uncle produced a gallon jug of excellent rye whiskey, and as "Doc" took several large and generous gulps, his eyes lit up with renewed energy and vigor.

We then went into the house and had dinner. Afterwards, "Doc" placed a little belladonna on the cow's tongue, and drove away. That night, several of the neighbors volunteered to sit up all night with the unconscious patient and the jug, but in spite of the most heroic efforts, both were dead in the morning.

"Doc" was not censured for this fatality, because he had warned us "she was powerful sick," and we accepted the loss as an act of God, and buried her without any ill-feeling. Had the patient survived the treatment, "Doc" would have received great credit.

As I look back on those times, over forty years ago, I must admire those hardy pioneers in veterinary science, who drove over muddy and snow-drifted roads, night and day, doing a little good here and there with the means at hand. There was probably not a graduate veterinarian within a hundred miles of us, and even empirics were scarce. I have thus been able to view the evolution of our profession during my span of years.

In those days treating a cow with indigestion or "wolf in the tail" was a fearful and wonderful undertaking. To help her regain the lost cud and to overcome the effects of

"Cowboy Charlie"

"Doc Asa"

Types of the self-made veterinary practitioner common during the author's boyhood. The air of authority with which they dispensed their medicines and their wisdom went far toward making up for their lack of scientific knowledge—at least, as far as their clients were concerned

"holler horn," she was given the oldest and saltiest dishrag available. This was accomplished with the aid of some of the most highly specialized Scotch-Irish profanity I have ever heard, for a number of the older men had served during the Civil War as mule skinners in the Army of the Potomac.

A "gosh-awful" sick horse caused a holiday, except in the harvest season, and the men would gather in to visit, chew tobacco or smoke, while offering suggestions in the way of treatment. Often, the women would come along, bringing some prize winning preserves or a "mess" of sausage just made. With no telephones, no radios, no movies, no autos, no highways, such rural occasions as weddings, births, deaths, "barn raisin's" or sickness in the family or among the livestock, ranked high as diversions and were widely attended. With the literary society meeting every other Friday night, and a box social held several times a year, most of our spare time was spent in doing the chores or, in winter, keeping warm.

As I look back I realize now it was a different world from that of today. Five dollars would keep me in spending money all winter, for there was little to spend it on. On account of the poor lights, it was the habit of our family to sit around the open fireplace and discuss world events, history, religion, politics or our school work. I never studied at night, even in college, for I was used to getting up early. Possibly that is one reason I have never been compelled to wear glasses.

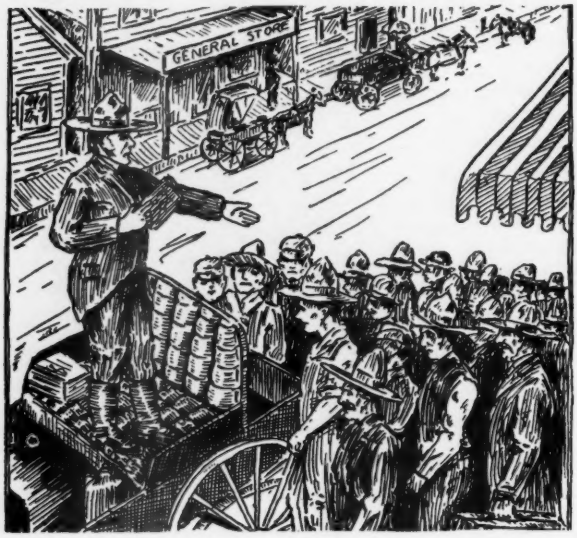
A narrative has been defined as "an orderly, continuous account of an event or series of events."

Whether this may properly be considered a narrative, or just the impressions of one man who has been "through the mill" makes little difference.

Anyway, it has been a pleasure to write these words, even if they will soon be forgotten.

E. T. BAKER.

Making a visit to the county seat, some 18 miles distant, was the most thrilling event of the year. Arising at three o'clock in the morning, we made nearly four miles an hour in our team and "hack," finally reaching our destination around nine o'clock. Having seen no railroad trains since my last trip there, I would stand in open-mouthed amazement as the "Buffalo Express" came puffing up to the station. Dapper-looking travelling men, wearing derby hats cocked on one side of their heads, would alight from the train in a graceful manner, and begin telling the station agent the latest stories just imported from Pittsburgh, or even as far as New York.



The medicine peddler was a familiar sight in those days. Many of the veterinary practitioners among the pioneers derived a handsome income from the sale of secret remedies of their own concoction. They traveled from town to town extolling the merits of their wares and collecting the dollars of the gullible. A common "line" was to proclaim themselves formerly "government veterinaries in the army"

At noon, we would go to the Reynolds House for dinner, where, for the extravagant sum of thirty-five cents, we were served a bountiful meal of roast pork, browned potatoes, stewed tomatoes, cole slaw, home made bread and rolls, butter, jam, jelly and other "spreads," topped off with a generous piece of apple pie served in a soup plate to be covered with honest-to-God cream. "Apple dumplin's" were also a great favorite. These were made out of bread dough and steamed until fluffy and delicious. In those days we knew nothing of calories, vitamins or hormones. We had to eke out a pitiful existence on "belly vittles," with an entire absence of salads, "boughten" canned foods or frothy pastries. For example, at home I was compelled to keep body and soul together with a breakfast consisting of oatmeal mush, buckwheat cakes, sausage, fried potatoes, homemade maple syrup and large quantities of butter, with about three big cups of coffee. For dinner, we would skimp along on roast or fried beef, cabbage, potatoes, jam, jelly, homemade bread or rolls, and pumpkin pie. For supper we had a light repast of fried side pork or scrapple, with fried corn meal mush, sliced onions in vinegar, fried potatoes, piccalilli or pickles, gingerbread, stewed dried peaches with cream, and plenty of bread, butter and apple or peach butter. It was very seldom I ever drank more than three cups of coffee at a meal, even when I had reached the age of ten. Due to the "stunting effects" of too much coffee while a boy I grew to be only six feet tall and to weigh around 180 pounds.

As I look back at the "Gay Nineties," or that period extending from the panic of '93 to the end of the Spanish-American War in 1900, I can visualize an entirely different world. The second era began in 1914, with the opening of the first World War, and continued until 1939, when a third epoch opened with the beginning of another great conflict.

(To be continued)

Book Reviews

Communicable Disease Control. *By Gaylord W. Anderson,* A.B., M.D., Professor and Head of the Department of Preventive Medicine and Public Health, University of Minnesota; Formerly Deputy Commissioner and Director of the Division of Communicable Diseases, Massachusetts Department of Public Health, and *Margaret G. Arnstein,* R.N., M.A., M.P.H., District Supervising Nurse, New York State Department of Health; Formerly Associate Professor of Preventive Medicine and Public Health and Director of the Course in Public Health Nursing, University of Minnesota. Cloth bound; 434 pages. The Macmillan Company, New York City, 1941. $4.25.

The material for this book was assembled with two objectives in mind: the protection of the individual and the protection of the community. The latter is necessarily the more complex problem because of the social, political and economic influences which may either facilitate or impede the execution of the proper control measures.

Topics of particular interest deal with the legal basis of communicable disease control, and with the administrative agencies necessary for carrying into effect the regulations which have been made by properly constituted legislative bodies. These regulations take into consideration the individual as a person and as one of a group of persons whose relationship, environment, economic status and interdependence constitute a complex problem of multiple ramifications. For the health and well-being of the community, as well as of the individual, it is essential that certain restrictions appertaining to all should be made, and that each person should understand and appreciate that any seeming hardship caused by these regulations will, in the long run, rebound to the benefit in health and security of the whole community.

A detailed account of the symptoms, contagiousness, etiology and treatment of a large number of common diseases is given. Included in this category are colds, whooping cough, measles, chickenpox, diphtheria, etc.

In addition, other diseases are described which are relatively new in importance by reason of research through which the causative agent, be it virus, bacillus or bacterium, has been isolated and, in many cases, the manner and source of its development have been demonstrated. Tularemia, the dysenteries, hookworm, undulant fever, plague and others may be placed in this group.

An entire chapter is devoted to each of several infectious diseases which at the present time are causing much concern and apprehension throughout the country. Encephalitis, meningococcic meningitis, anterior poliomyelitis and others come under this classification. Chapter XXIII, for example, includes an enumeration of the several types and the symptoms of encephalitis. The differentiation of the types and their causative agents are given. The mode of transmission, method of infection and probable insect vector have been the subject of much research during the past decade. Each day more data concerning these viruses and the method of transmission to man are garnered, but much yet remains to be learned.

The control of the communicable disease in the home is a subject of supreme interest to everyone. It is amply described in this volume.—*G. H. C.*

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The American Illustrated Medical Dictionary. *By W. A. Newman Dorland,* A.M., M.D., F.A.C.S., Lieut.-Colonel M. R. C., U. S. Army; Member of the Committee on Nomenclature and Classification of Diseases of the American Medical Association; Editor of "American Pocket Medical Dictionary" With the collaboration of *E. C. L. Miller,* M.D., Medical College of Virginia. 19th Ed. Leatherette binding; 1,647 pages, 914 illustrations. W. B. Saunders Company, Philadelphia, 1941. Plain, $7.00; thumb indexed, $7.50.

The first edition of Dorland's illustrated medical dictionary appeared in 1900. In the two-score years that have elapsed since there have been 18 editions. The nineteenth has just been published. Throughout all that period the repeated editions have kept it a standard reference work on medical science. In the present edition the dictionary has been completely revised and enlarged. Its 1,647 pages include 2000 new definitions, and there are 914 illustrations, including 269 portraits. All phases of the science of medicine and kindred sciences are covered in this new edition. It is essential for all who have need for the latest information upon these subjects.

Immunity Against Animal Parasites. *By James T. Culbertson,* Assistant Professor of Bacteriology, College of Physicians and Surgeons, Columbia University. Cloth bound; 284 pages, illustrated. Columbia University Press, Morningside Heights, N. Y., 1941. $3.50.

This is a textbook the purpose of which is to acquaint those beginning the study of immunity to parasites with the fundamental principles of the subject, and to give the more experienced a thorough orientation and collation of the heterogeneous and voluminous recent literature in this field. The material is therefore presented in a manner useful to the beginning student, to the trained investigator, and to the practicing physician or veterinarian.

The book presupposes a knowledge of both parasitology and immunology; hence no elementary delineation is given either of parasite life history or of general principles of immunity.

Part I deals with natural resistance and acquired immunity in general, including the mechanisms of specific immunity and the methods of demonstrating immunity.

Part II discusses immunity in specific diseases—the amebiases, the leishmaniases, the trypanosomiases, the malarias, the coccidioses, the trematodiases, the cestodiases, the nematodiases, and the response to arthropods.

Part III, Applied Immunology, includes chapters on the classification of parasites, vaccination against parasites, and the diagnosis of parasitic infection.

The text is carefully documented by numerous footnote references, which taken all together comprise a valuable bibliography on the subject.

The author has performed a noteworthy job of assembling, evaluating, and presenting the available material in this field, and the book should be of interest and use to the veterinary practitioner, as well as to those engaged in immunological investigations.

You may obtain any book reviewed in this department by remitting the published price to the Book Department of VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago, Ill.

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New Developments in the Feeding and Nutrition of Horses and Mules, a 12-page pamphlet of the Horse and Mule Association of America, consists of an address presented to that organization by Dr. F. B. Morrison, Chief, and Prof. G. W. Salisbury, of the Animal Husbandry Department of Cornell University. The general feed requirements of the Equidae, and their protein, mineral and vitamin needs, are discussed briefly. The pamphlet costs 10c and may be obtained from the Horse and Mule Association, 407 S. Dearborn St., Chicago, Ill.

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Training Riding Horses is a 28-page booklet issued by the Horse and Mule Association of America. It sets forth in pictures and comments the training methods used on four well-known cattle ranches — the great King Ranch at Kingsville, Texas, the 6666 Ranch, the Lipian Springs Ranch, and the Elkhorn Springs Ranch. The methods used at the four establishments differ, but all achieve the same goal—the development of riding horses of good type, fast, reliable, and well-trained. The picture-comment presentation is practical and easy to follow. The booklet may be obtained from the Horse and Mule Association, 407 S. Dearborn St., Chicago, Ill., for 25c.

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What's New in Farm Science, a report published annually by the Agricultural Experiment Station of the University of Wisconsin, Madison, Wis., consists of two parts. Part I, now ready for distribution, includes: Farm Income and Welfare; Farm Engineering; Dairy Products; Home Economics; Animal Diseases and Breeding; Animal Nutrition; Bacteria, Molds and Yeasts; Game Management. Part II, which will be available in the spring, includes: Livestock Feeding; Poultry; Insect Pests; Field Crops; Plant Diseases; Soil Fertility; Garden, Orchard and Cash Crops. Either or both parts of this publication may be obtained free by applying to the Wisconsin station.